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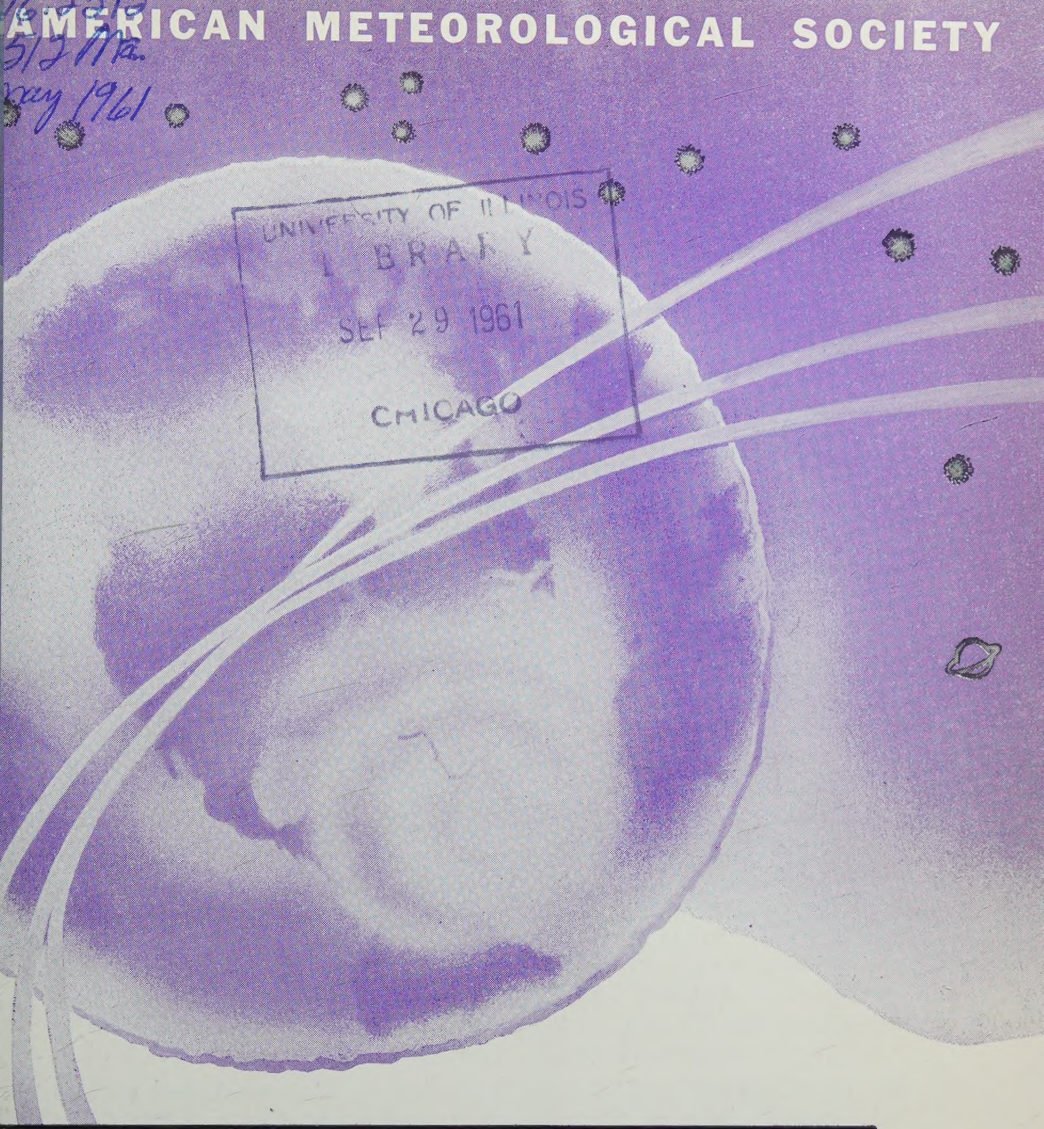

Meteorological & Geoastrophysical ABSTRACTS

Vol. 12 MAY 1961 NO. 5

METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

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EDITORIAL OFFICE: Washington, D. C. **P.O. ADDRESS: Box 1736, Washington 13, D. C. Telephone: REpublic 7–6278.

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A. Current Abstracts in English on important meteorological and geoastrophysical literature in every language.

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METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

MALCOLM RIGBY, Editor

Vol. 12 May 1961 No. 5

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Special Feature in This Issue

Annotated Bibliography on Upper Atmosphere Structure (80-300 km)

By

Elemer Kiss

(For complete table of contents see back cover)

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FOREWORD

Meteorological and Geoastrophysical Abstracts is a monthly publication devoted to current literature in meteorology, geophysics and astrophysics.

Part I contains abstracts of current literature in the fields of meteorology, etc.

Part II of each issue comprises an annotated bibliography of important references on a special subject. Bibliographies published in the successive issues were:

Vol. I, 1950

1. Atmos. Pollution	2. Aerobiology	3. Cloud Physics	4. Hail
5. Tornadoes	6. Volcanic Dust	7. Climat. Changes	8. Thunderstorms
9. Icing	10. Acoust. Propagation	11. Evaporation	

Vol. II, 1951

1. Extended Forecast.	2. Long Range Forecast.	3. Soil Temp.	4. Constants, etc.
5. Clim. of Near East	6. Clim. of Middle East	7. Special Winds	8. Radar Storm
9. Condensation Trails	10. Clim. of N. E. Africa	11. Mountain Met.	Detect.

Vol. III, 1952

1. Clim. of N. W. Africa	2. Carbon Dioxide	3. Clim. of Argentina, etc.	4. Dew
5. Objective Forecast.	6. Stratus Forecast.	7. Urban Climatology	8. Clim. of C. Africa
9. Visibility	10. Glaze and Rime	11. Free Air Turbulence	

Vol. IV, 1953

1. Turbulence Theory	2. Turbulent Diffusion	3. Frost	4. Clim. of Australia, etc.
5. High Level Winds	6. Winds in Stratosphere	7. Jet Stream	8. Radiation Bioclim.
9. Clim. of Pacific	10. Auroras	11. Sferics	

Vol. V. 1954

1. Oceanog. Met.	2. Clim. of S. E. Asia	3. Auroral Physics	4. Tropopause
5. Balloons	6. Numerical Forecast.	7. Radiation Data	8. Vertical Motion
9. Clim. of Arctic	10. Industrial Met.	11. Wind Waves and Swell	

Vol. VI, 1955

1. Bibliog. of Bibliog.	2. Texts & Monogr. Bibliogs.	3. Storm Surges
4. Ionospheric Prop.	5. Photochem.—Upper Atmos.	6. Cloud Physics
7. Radar Cloud Physics	8–9. Atmos. Nuclei 10. Weather Modification	11. Cooling Power

Vol. VII, 1956

1. Synoptic Met.-Arctic	2. Clim. of Enclosed Spaces	3. Cosmic Rays (–1952)
4. Cosmic Rays (1953–56)	5. Atmos. Radioactivity	6. Inversions
7. Snow Micromet.	8. Snow Micromet. (Suppl.)	9–11. Tropical Cyclones

Vol. VIII, 1957

1. Solar Weather Relations	2. Night Airglow	3. Forecasting Special Elements
4. Forest Micrometeorology	5. Hydromet. Forecasting	6. Numerical Forecast. (Suppl.)
7. Albedo 8. Meteors	9–10. Tropospheric Prop.	11. Medical Meteorology

Vol. IX, 1958

1. Radioastronomy	2. Solar Astrophysics	3. Radioactivity in Atmosphere
4. Waves and Currents	5. Physical Oceanog.	6. Dynamic & Phys. Oceanog.
7. Long Range Forecast.	8. Radar Met. 9. Cosmic Rays	10–11. Geomagnetism

Vol. X, 1959

1. Works of C. E. P. Brooks	2. Tornado Forecasting	3. Soil Moisture	4. Sferics
5–6. Ozone	7. Acoustic Waves	8. Evaporation Measurement	
9. Evapotranspiration (–1955)	10. Evapotranspiration (1956–1959)	11. Evaporation	

Vol. XI, 1960

1. Outstanding Reference Works	2. Outstanding Texts	3. Numerical Forecast. (Suppl.)
4. Ionospheric Physics	5. Ionospheric Propagation	6. Ionosphere
7. Forecast Verification	8. Radar Meteorology	9. Rocket Meteorology
10. Satellite Meteorology	11. Airglow	

Bibliographies in preparation or published in Vol. XII

Aurora (No. 1)	*Upper Atmosphere Structure* (No. 4, 5 and 6)
Auroral Physics (No. 2)	*Precipitation Chemistry* (No. 7)
Limnology (No. 3)	*Upper Atmos. Humidity*

Part III contains a listing of reviews, translations, reprints, and the contents of important publications. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where the material may be found. The Union List of Serials (Gregory) is the source of most of the symbols used. In some cases, where no symbol has been assigned to a library, one will be devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DNLM:	U. S. National Library of Medicine, Washington, D. C.
DSI:	Smithsonian Institution, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by charts.
Ⓢ	after an abstract indicates an abstract prepared for NASA.

Geographic locations are in the English form rather than the form used locally, for example, Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwise stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet using a modification of the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months are abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Number (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus an entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, *Jahrgang* 2 (Vol. 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL AND GEOASTROPHYSICAL MATERIAL

A. GENERAL

A1. COLLECTED WORKS

12.5–1 52(082.1)

Beer, Arthur (*ed.*), **Vistas in astronomy, Vol 3.** London, Pergamon Press, 1960. 345p. figs., tables, refs., eqs. (For listing of pertinent articles, *see* 12(2): . . . , Feb. 1961, *Met. Abs.* These articles abstracted separately.) "Two other volumes in preparation—ed." (For abstract on Vol. 1–2, 1955, *see* 10.10–6, Oct. 1959, *Met. Abs.*) (Also issued as: *Journal of Atmospheric and Terrestrial Physics*, London, Special Supplement No. 7.) **DWB** (520.82 B415v), **DLC** (QB3.B35)—This third of the series of collections of works on astronomy and astrophysics contains 21 articles by prominent authors in 15 countries including 13 from England, 4 from U. S. and one each from the U.S.S.R., Germany, Sweden and Ireland. The subject matter includes articles on planets, auroras, artificial satellites, comets of 1957 (4 articles), instrumentation, cosmogony, spectroscopy, gravity effects on the sun, the clock paradox, etc. *Subject Headings:* **1. Astronomy compendiums 2. Astrophysics collections 3. Vistas in astronomy.**—*M.R.*

12.5–2 551.509.6(08)

Resources for the Future, Inc., **Science and resources: prospects and implications of technological advance.** Essays by George W. Beadle et al. Ed. by Henry Jarrett. Baltimore, Johns Hopkins Press, **1959.** 250 p. figs. Price: 40 sh. Section 2 on Weather Modification includes: Byers, Horace R., **What are we doing about the weather?,** p. 37–53. Anderson, Clinton P., **Toward greater control: high risks, high stakes,** p. 54–62. Ackerman, Edward A., **Weather modification and public policy,** p. 63–71. These articles abstracted separately. **DLC** (Q171.R43). Review by R. G. V. in *Weather*, London, 15(7):250, July **1960.**—The general subjects covered in this collection of articles on future resources are: I. Genetics; II. Weather modification; III. Mineral exploration; IV. Chemical technology; V. Nuclear energy; and VI. Outer space. In Ch. II, on **Weather modification,** Horace Byers sums up the current status of weather modification, especially research and statistical controls, and suggested changes in radiation balance. Sen. Clinton P. Anderson discusses the great risks and great rewards or, as he puts it, "high stakes" involved in control of climate. Both good and harm come from past efforts and may come from future experiments. Edward A. Ackerman mentions the need for a change in public policy toward weather research so that it may be accelerated. *Subject Headings:* **1. Resources of the future 2. Weather control research. I. Jarrett, Henry** (*ed.*)—*M.R.*

12.5–3 551.585.9(213)(08)

Pacific Science Congress, 9th, Bangkok, Nov. 18–Dec. 9, 1957. **Proceedings, Vol. 20, Special Symposium on climate, vegetation, and rational land utilization in the humid tropics.** Sponsored by UNESCO as part of their program of Humid Tropic Research. Pub. by the Secretariat, 9th Pacific Science Congress, by Dept. of Science, Bangkok, Thailand, **1958.** 169 p. figs., tables, refs. Price: $2.00. (For listing of contents, *see* 12(3): 642, March 1961, *Met. Abs.* These articles abstracted separately.) **DWB** (M(06) P117p)—This special Symposium on climate, vegetation and rational land utilization in the humid tropics was mainly concerned with the conservation of the natural resources of the humid tropics and the human efforts needed in the face of the world's population explosion. The background material of this symposium consisted of eighteen papers made available to participants and audience in advance. Active discussion followed most of the papers, much of which was

recorded and is published here. L. Dudley Stamp presented a summation of the content o the papers and discussion, and formulated certain tentative conclusions resulting from them This was followed by an extensive general discussion among participants and audience. Th participants were: F. R. Fosberg, David I. Blumenstock, C. G. G. J. Van Steenis, Caro Troll, D. L. Bramat and R. Dudal, Franke E. Egler, Pierre Dansereau, Henr Gaussen, C. S. Christian, E. Aubert de la Pire, Dioscoro S. Rabor, Carl O. Sauer ooi Jin Bee, Karl J. Pelzer, R. O. Whyte, Colin Marshall and L. Dudley Stamp *Subject Headings:* **1. Conservation symposia 2. Humid tropics symposia. I. Fosberg, F. R** (*chairman*).—*E.Z.S.*

12.5–4 551.511(08

Kibel', I. A. (*ed.*), **Collection of articles on dynamic meteorology.** *Soviet Research in Geophysics* (issued by American Geophysical Union), N. Y., Vol. 1, **1960.** 181 p. figs., tables refs., eqs. **DWB** (M11.3 K46co). Transl. by Consultants Bureau, N. Y. of the origina Russian, **Sbornik stateĭ po dinamicheskoĭ meteorologii,** issued as *Akademiia Nauk SSSR Geofizicheskiĭ Institut, Trudy*, No. 37(164), **1956.** 141 p. (For listing of contents of origina Russian (abstracted separately), *see* 8:1558, Nov. 1957, *Met. Abs.* For listing of Englis translated titles, *see* 12(2): 383, Feb. 1961.)—A collection of 7 articles which vary from a theory for the calculation of soil temp. at various depths from a given air temp. to the problem of the distribution with depth of a steady current in a baroclinic ocean layer. A method wa developed to calculate the horizontal circulation for the actual ocean from the atmospheric pressure field. In the third paper, by Feĭgel'son, **The influence of clouds on the atmospheri heat balance** is considered. The transfer of long-wave radiation in an atmosphere having a homogeneous horizontal cloud layer is investigated. The scattering and absorption of long wave radiation in the cloud, the transmission characteristics of the atmosphere with clouds and the selective character of the absorption spectrum of water vapor outside the cloud were considered. The next paper (by Malkevich) considered atmospheric cooling by radiational hea exchange. The selective absorption of long-wave radiation by water vapor was studied. An atmospheric layer being cooled and one being warmed by long-wave radiation are shown to exist; also a temp. distribution with small fluctuations is shown to occur with irradiated long wave radiation. Malkevich was also responsible for the paper on the **Temporal change o air temp. by turbulent mixing and radiational heat exchange,** as well as the study on the **Theoretical consideration of the solar radiation absorbed by the atmosphere for differen time intervals.** Finally, S. I. Kogan proposed a method of calculating the advective hea influx based upon an approximation of the temp. field in the immediate neighborhood of a poin with second order surface. Two examples are shown. *Subject Headings:* **1. Dynamic meteor ology 2. Soil temperature calculations 3. Baroclinic ocean layer 4. Heat balance 5. Radia tional heat exchange 6. Turbulent mixing 7. Solar radiation absorption 8. Advective heat influx.**—*E.Z.S.*

A2. TEXTBOOKS—MONOGRAPHS

See also: **Study of weather stations for Army use** (Goettelman et al.), 12.5–95; **Planetary frontal zones, N. and S. Hemispheres** (Pogosian), 12.5–218; **Typing of reversals, Central Europe** (Grünewald), 12.5–223.

12.5–5 551.326.83(02

†Rymsha, Vladislav Aleksandrovich, **Ledovye issledovaniia na rekakh i vodokhranilishchakh.** [Ice research on rivers and reservoirs.] Leningrad, Gidrometeoizdat, **1959.** 190 p. 61 figs., 5 tables, 50 refs., 66 eqs. **DWB** (551.311 R995Le)—This monograph could be used as a handbook or hydrological textbook by students of hydrology, hydrological engineers, and by research workers. It deals with equipment, observation techniques, research and applications of theory and knowledge of ice formation processes on rivers and reservoirs. The first of the 7 chapters deals with general, theoretical and historical aspects of the subject; Ch. 2, with methods of measuring heat loss between the "open" season and winter; Ch. 3, with the winter thermal regime of water courses; Ch. 4, with equipment for measuring temp. of water and ice (water thermometers, micro thermometer GR-2, optical attachments, depth attachments, photo equipment, deep water thermometers, electrical thermometers, etc.);

Ch. 5, with ice phenomena on rivers and lakes during freeze-up; Ch. 6, with ice phenomena on rivers during break-up; Ch. 7, with physical characteristics of ice and sluch. Practical examples are given and forms, working and conversion tables, and references (all to Soviet literature) are appended. Instruments and equipment are illustrated and monograms and calibration curves, etc. presented along with theory and text. *Subject Headings:* **1. River ice observation textbooks 2. Ice research 3. U.S.S.R.**—*M.R.*

12.5–6 551.578.46(02) 551.578.46(47)

*†Kuz'min, Prokofiĭ Pavlovich, **Formirovanie snezhnogo pokrova i metody opredeleniia snegozapasov.** [Formation of snow cover and methods of determining snow supply.] Leningrad, Gidrometeoizdat, **1960.** 169 p. 32 figs., 30 tables, bibliog. 162 items p. 162–168, 80 eqs. At head of t-p.: Gosudarstvennyĭ ordena Trudovogo Krachnogo Znameni Gidrologicheskiĭ Institut. **DWB** (M78.46 K97fo)—A short textbook, on various aspects of snow cover in the U.S.S.R. and its water content, for use by students of geography or hydrology, or technicians working in cognate fields. Theory, illustrations, data in the form of tables and statistical curves, charts, nomograms etc. are amply interspersed throughout the monograph. An extensive bibliography of 159 Russian and 3 non-Russian references is appended. The major chapter headings are: I. Conditions for formation of precipitation (in clouds) and snow cover; II. Physical factors affecting movement and settling of snow (wind speed, etc.); III. Distribution of snow cover (effect of forests, relief, vegetation); IV. Snow at beginning of melt season and methods of surveying, measuring or estimating water content and water supply. *Subject Headings:* **1. Snow cover physics textbooks 2. Snow cover in U.S.S.R. 3. U.S.S.R.**—*M.R.*

12.5–7 551.579(02) 551.481.1

*†Karaushev, A. V., **Problemy dinamiki estestvennykh vodnykh potokov.** [Problems in the dynamics of natural water streams.] Leningrad, Gidrometeoizdat, **1960.** 389 p. 98 figs., 36 tables, bibliog. p. 385–389, numerous eqs. **DWB** (551.48 K18pr)—A standard format textbook on problems related to the dynamics of currents in rivers, lakes and reservoirs including wind, flood and tidal currents, density currents, currents due to lowering of lake levels at outlet, etc. The 8 main chapters cover: 1) turbulence, pulsations and velocity profiles; 2) currents connected with wind and ice action; 3) cross sections and plane sections of currents; 4) surface currents, ebb and flood effects; 5) wind waves, their refraction and diffraction; 6) distribution of matter and heat in currents; 7) movement of sediment and 8) channel processes. The textbook is intended for hydrologists, engineers, students of hydrotechnology and teachers. It is weighted toward the graphical or practical, although a great deal of theory is also included. A bibliography of 131 Russian and 18 non-Russian works in this field is appended. Many examples are worked out or presented in the text. *Subject Headings:* **1. Dynamic hydrology textbooks 2. Limnology 3. Current dynamics.**—*M.R.*

12.5–8 551.585:551.586:634.8(47)

*†Davitaia, F. F., **Klimaticheskie zony vinograda v SSSR.** [Climatic zones of viticulture in the U.S.S.R.] 2d ed. Moscow, Pishchepromizdat, **1948.** 192 p. 41 figs., 28 tables, 306 refs. At head of t-p.: Vsesoiuznaia Akademiia Sel'skokhoziaistvennykh Nauk . . . Vsesoiuznyĭ Institut Rastenievodstva. **DLC** (SB397.D3 1948)—The first edition of this unique book was published in 1936. The second edition was considerably enlarged and revised on the basis of detailed work in this field in 1938–1946, much of it by other authors who contributed to the monumental volumes of **Ampelografiia SSSR.** Various chapters discuss: I. The history of application of climatology to viticulture; II. Problems of climatic classification for agriculture; III. Biological significance of various meteorological factors (thermal regime and moisture balance); IV. Thermal reliability of growing season and its calculation or statistical analysis; V. Climatic characteristics significant for grape cultivation (temp. at beginning and end of growing season), differences in requirements of varieties, degree-days, effect of high temperatures, temp. data for years with good grape harvest (1777–1878) and statistical analysis of temp. in relation to 6 categories of grape harvest etc., using various base-lines (0°, 5° and 10°C) for different places and sensitivity of grapes to light, length of day and night, moisture in period of greatest growth and of reproduction, wintering conditions, autumn and

spring; VI. Geographic-historic method of study of the relation of crops to climate; VII. Northern limits of grape cultivation depending on climatic condition; VIII. Northern limits of wild grapes; IX. Maps of climatic zones for grape culture in U.S.S.R.; X. Climatic possibilities of propagating grapes in mountain regions of the U.S.S.R.; XI. Microclimatic conditions and their effect in compensating for conditions in the macro-zone; XII. Agrotechnical means of protection against unfavorable climatic conditions; XIII. Extending cultivation beyond limits of zones established—problems of selection. Ch. V (p. 44–135) is by far the most ambitious, presenting as it does the statistical graphs and scatter diagrams resulting from scores of experiments in many places and testing many parameters. The 3 large detailed color charts have been redrawn. They show the N and S limits and the altitude limits of various varieties of grapes in 1) Western Eurasia, 2) Eastern Eurasia and 3) the grape growing regions of S. Central U.S.S.R. *Subject Headings.* **1. Climatic zones for viticulture 2. Viticulture 3. Agricultural climatology 4. U.S.S.R. 5. Eurasia.**—*M.R.*

12.5–9 551.57 551.593 551.594

Zamorskiĭ, Aleksandr Dmitrievich, **Atmosfernye iavleniia.** [Atmospheric phenomena.] Leningrad, Gidrometeoizdat, **1959.** 94 p. 36 figs. (For abstract on 1954 ed. *see*, 9.2–22, Feb. 1958, *Met. Abs.*) **DWB** (M10 Z25at 1959)—A popular scientific booklet describing qualitatively the various atmospheric phenomena, which are observed without instruments, and explaining the physical causes of the phenomena. The contents include the following: deposition of water upon terrestrial objects—dew, liquid deposit consisting of films of water when warming succeeds cooling in winter, deposition of fog droplets and water of melting hoar frost; radiational hoar frost, hoar frost flowers and solid deposits in the form of ice or snow resulting from the sublimation of water vapor or freezing of fog droplets; supercooling of water including rain during frost, freezing of supercooled drops, evaporation of drops and growth of ice crystals and formation of supercooled rain; icing of transmission lines and trees such as crystalline rime, granular rime, glaze, frozen water drop upon objects, and of freezing of drops; liquid precipitation, formation of rain, colored rain, drizzle and rain with frost; solid precipitation including snow, snow pellets and snow grains, hail and ice rain; radiation fog, advection and evaporation fog, polar fog, adiabatic fog, fog intensity, haze and other types of atmospheric turbidity due to water particles; air turbidity due to ice particles such as ice crystals in the atmosphere near the ground, and snow storms; atmospheric turbidity due to dust including dense dust and dust storms, dust transport at the surface of the earth and dry mist; dust storms and tornadoes including squalls and dust devils; light phenomena in the atmosphere such as rainbows, coronas, halos and mirages; and various electric phenomena in the atmosphere such as thunderstorm and lightning, quiet luminous discharges and polar auroras. Numerous drawings and photographs accompany the text. *Subject Headings.* **1. Atmospheric phenomena 2. Hydrometeors 3. Optical phenomena 4. Electrical phenomena.**—*I.L.D.*

12.5–10 551.501.9 551.5:373.5

†Kolokol'nikov, Alekseĭ Nikolaevich, **Samodel'nye meteorologicheskie pribory (prakticheskoe rukovodstvo dlia uchiteleĭ sredneĭ shkoly).** [Homemade meteorological instruments: practical guidance for instructors of secondary schools.] Moscow, Akademiia Pedagogicheskikh Nauk RSFSR, **1956.** 75 p. 135 figs., bibliog. p. 70–74. **DWB** (M08 K81sa)—A pamphlet giving somewhat detailed instructions, illustrated by schematic diagrams, for constructing and maintaining instrument shelters, wind vanes, psychrometers, hair hygrometers, soil thermometers and soil moisture meters, rain gages, shielded snow gages, snow density meters, nephoscopes, anemometers (station and field), sun dials and, finally, instructions for keeping records at the level of students of secondary schools. Finally, the laying out of a meteorological "plot" is described and illustrated. *Subject Headings.* **1. Amateur weather stations 2. Meteorological instrument construction 3. Teaching meteorology in high schools 4. U.S.S.R.**—*M.R.*

12.5–11 551.582.1(584.6)

†*Uteshev, A. S. (*ed.*), **Klimat Kazakhstana.** [Climate of Kazakhstan.] Leningrad, Gidrometeoizdat, **1959.** 366 p. 171 figs., 159 tables, 246 refs. At head of title: Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby pri Sovete Ministrov SSSR, Kazakhskiĭ

Nauchno-Issledovatel'skiĭ Institut. **DLC** (QC990.K38U8)—The characteristics of the climatic conditions and their stimulating factors are described with maps, tables and charts in reference to various climatic zones, microclimatic variations and with consideration of atmospheric drought, precipitation and other weather conditions. General climatic characteristics of Kazakhstan are described as definitely continental and arid with strong variable winds, causing snow or dust storms and erosion. In the mountain region, during warm weather, intensive showers create floods, washing out and high water in the industrial and agricultural regions. During severe winter the ground freezes to a considerable depth and for a long period. On the other hand, the climatic resources of Kazakhstan are not completely utilized, particularly in industrial power development and for intensification of the agricultural economy. The monograph is composed of two major parts: one, which describes general climatic characteristics, climate forming factors (radiation and circulation), local weather, climatic zones, microclimate of the steppe and desert regions, and arid phenomena (atmospheric drought). This section is illustrated with geographic map in color, map with distribution of various types of soils and vegetation and with 74 various smaller maps with isolines and charts on radiation, cyclone movements, atmospheric circulation, temp. distribution, local climatic variations (freezing, arid, etc.), kinematics of arid processes with monthly distribution of microclimatic characteristics and many other climatic factors. The second part of the monograph contains the analysis of separate climatic elements such as: pressure, wind, temperature, humidity, precip., snow cover, snowstorms, cloudiness, fogs, thunderstorms, soil temp., etc. The climatological description is related mainly to the lowlands; climates of the mountains are described partially in reference to general analysis of the meteorological elements and for evaluation of their effect on the lowlands. The characteristics of separate climatic elements are based on many years of observations made by over 200 local meteorological stations and perfected and supplemented with the data of the meteorological system obtained during last decade up to 1956. The description of the second part is illustrated with 98 maps and charts on variation of separate climatic elements and with 116 tables with assembled data. The bibliography contains 246 references. *Subject Headings.* **1. Climate of Kazakh S.S.R. 2. Kazakh S.S.R.**—*N.P.S.*

12.5–12 551.582.1(58)

*†Balashova, E. N.; Zhitomirskaia, O. M. and Semenova, O. A., **Klimaticheskoe opisanie respublik Sredneĭ Azii.** [Climatological description of the Republics of Middle Asia.] Leningrad, Gidrometeoizdat, **1960.** 240 p. 93 figs., 105 tables, 56 refs. At head of t-p.: Sredneaziatskiĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut. **DWB** (M82.1/584 B171kL)—This is one of the most comprehensive of the recently issued climatological studies of the several regions of the U.S.S.R. It covers successively: the topographic, radiational and astronomical influences on the climate; the synoptic, seasonal and local characteristics of the climate of Central Asiatic U.S.S.R.; the characteristics of the various climatic or meteorological elements: pressure, wind, temperature of the air and soil, humidity, cloudiness, sunshine, precipitation, snow cover, blizzards, fog, thunderstorms, glazed ice, frost, hail and harmful weather or climatic factors. Finally, the regional climates (24 regions) are briefly treated. A great deal of recently compiled climatic data are presented in analytical form, and numerous graphs, charts, weather maps, both for the surface and upper air, etc., are included by way of illustration. *Subject Headings.* **1. Climatology of Central Asiatic U.S.S.R. 2. Climatic data for Central Asiatic U.S.S.R. 3. Central Asiatic U.S.S.R.**—*M.R.*

12.5–13 535.24:523.43

*Barabashov, Nikolaĭ Pavlovich and Koval', I. K., **Fotograficheskaia fotometriia Marsa so svetofil'trami vo vremia velikogo protivostoianiia v 1956 g.** [Photographic photometry of Mars with light filters during great opposition in 1956.] Khar'kov, Izdat-vo Khar'kovskogo Ordena Trudovogo Znameni Gosudarstvennogo Universiteta, **1959.** 529 p. 7 figs., numerous tables. **DLC** (QB516.B245)—The method and results of the investigation of Mars by the Kharkov Astronomic Observatory is described with 457 pages of tabulated data. Two maps of Mars and 67 charts are included. Construction and operation of the Zeiss optical reflector and refractor are described with their basic characteristics. Adjustment of the photographic equipment and exposure characteristics with different filters are described with tabulated data.

Method of processing visual and photographic data and their interpretation are briefly outlined in the text. Clouds, nebulae and precipitation observed on the surface of Mars and their relative positions are recorded in tables and on the map of Mars. Appendix contains the graphs on distribution of intensities along the equator and central meridian of the planet. *Subject Headings.* **1. Photometry of Mars 2. Mars.**—*N.P.S.*

12.5–14 551.558:551.513.2:551.557.5

Defant, Friedrich, **On vertical motions and transversal circulations at the eastern and western side of long-wave disturbances in the summer subtropical jet-stream.** International Institute of Meteorology, Univ. of Stockholm, Contract 61(514)-963, Technical Note, No. 7, (1960). 52 p. 11 figs., 6 tables, 9 refs., eqs. **DWB** (M(061) I615n)—Wind direction in the polar and subtropical cores of atmospheric westwind drift is studied with reference to the typical properties of the jet cores during a few summers. Discusses the three natural spaces within the atmosphere known to have some characteristic vertical temperature distributions and a typical tropopause level. Investigations of selected regions at the eastern and western sides of long wave disturbances in the subtropical jet cores show the position of each wave, its dimension in relation to the jet direction, and its mean values for the front and rear sides of the region. The longer side of the region is about 2900 km at the front and only 2500 km at the rear. This is attributed to the asymmetry of the waves. The rest of the report gives the derivations of equations for the vertical and transversal velocity components developed for the study of upper atmospheric layers. *Subject Headings.* **1. Jet stream analysis 2. Vertical motion 3. Subtropical jet stream.**—*N.N.*

A3. HANDBOOKS—MANUALS—ATLASES

12.5–15 551.501.1:551.506.7:551.507.321.2:373.63(02)

U. S. Weather Bureau, **Training guide in pilot balloon observations.** Prepared by Observations and Station Facilities Division. 3d ed. Its *Training Paper*, No. 6, July **1959.** 30 p. figs., tables. **DWB** (M01.1 U587tr)—Discusses procedures used in making winds-aloft observations, such as: 1) setting up theodolites; 2) balloon inflation; 3) tracking balloons; 4) reading and recording angular data; 5) evaluation of pibal data and 6) significance of code message to observers at various stations. *Subject Headings:* **1. Pilot balloon observation techniques 2. Pilot balloon manuals 3. Observers manuals.**—*N.N.*

12.5–16 551.501.1:551.509.5:551.501.81:551.515.3(02)

Radiation, Inc., Melbourne, Florida, **Handbook of instructions (for) the experimental Tornado Warning Radar Trailer, No. 97-00199.** Contract Cwb-9571, (Unnumbered Report), March 2, **1959.** 45 p. 26 figs. (incl. photos), 2 tables, eqs. **DWB** (M(051) R129ha)—An extensively illustrated handbook containing information on continuous wave (CW) Tornado Warning Radar. Continuous wave radar systems are used primarily to obtain useful data from moving targets. To obtain intelligible target information, one of the many adaptations of the Doppler principle is employed in these systems. The information acquired, in the case of Tornado Warning Radar, is used to indicate the relative velocities within a tornado. *Subject Headings:* **1. Tornado warning radar manuals 2. Observers manuals.**—*I.S.*

12.5–17 551.501.1:551.508.822(02)

U. S. Weather Bureau, **Manual de instruccion para observaciones de rawinsonde.** Spanish translation of its *Circular P*, 7th edition, **Manual of radiosonde observations.** Spanish ed. issued June **1957.** 198 p. figs., forms. loose-leaf. (For abstract on English 6th ed., *see* 5E–118, May 1954, *Met. Abs.*) **DWB** (M01.1 U587c, P-7th ed. Span.)—The Spanish version of the 7th edition of Circular P contains a few explanations which make it possible to use it in training observers in Chile, Peru and Ecuador for IGY radiosonde observations. Illustrations are reproduced. *Subject Headings:* **1. Radiosonde observation manuals 2. Observers manuals.**—*M.R.*

12.5–18 551.509.1:551.506(26)

U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby, **Kod dlia peredachi rezul'tatov nabliudeniĭ za sostoianiem pogody i moria shturmanskim sostavom sudov KH-09-S.** [Code for the transmission of weather and sea observations by the personnel of KH-09-S ships.] 2d ed. Leningrad, Gidrometeoizdat, **1957.** 19 p. tables (1 fold. in pocket). **DLC** (QC872.R82 1957)—This second edition of the code for transmitting conditions at sea is effective Sept. 1, 1957. The first edition was published in 1954 and followed the International Marine Weather Reporting Specifications. Besides the two locator groups $YQ\ L_a\ L_a\ L_a$ and $Lo\ L_o\ L_o\ G\ G$, the 7 other groups $N\ dd\ fm\ fm$, $V\ V\ ww\ W$, $P\ P\ P\ T\ T$, $N\ C_L\ h\ C_M\ C_H$, $I\ d_w\ d_w\ Pw\ Hw$ and 3 $P_w\ T_w\ T_w\ T_w\ Ice$ or $C_2\ K\ Di\ re$ groups are given and explained in detail. *Subject Headings:* **1. Marine weather code 2. Soviet weather codes.**—*M.R.*

12.5–19 551.501.1:551.501.75(02)

U. S. Weather Bureau, **Manual of winds-aloft observations (WBAN).** Its *Circular O*, 5th ed., Sept. **1959.** 182 p. figs., tables. Also: **Weather Bureau Addendum.** Issued Sept. **1959.** 25 p. both **DWB** (M01.1 U587c). Note in preface: First ed. is regarded as its *WB* 740, issued **1921, Instructions for aerological observers.** 2d ed., **1928** and 3d ed., **1940,** reprinted **1942** had title, **Instructions for making pilot balloon observations** (both *Circular O*). 4th ed. **1950** had title **Manual of winds-aloft observations. DWB** —This manual contains exhaustive material on the following: The rawin and pibal equipment, observations, evaluation of winds aloft observations, marine winds aloft observations and the WBAN forms designed primarily for identification purposes. Included are summaries on "fallout wind computations," tables on the above and related subjects, illustrative material which include the plotting of winds-aloft, the extraction of wind directions and speeds from plotting rawin boards and many others. *Subject Headings:* **1. Winds-aloft observation manuals 2. Observers manuals.**—*N.N.*

12.5–20 51(02) 53(02)

Meyler, Dorothy S. and Sutton, Oliver Graham, **Compendium of mathematics and physics.** Princeton, N. Jersey, Van Nostrand, **1957.** 384 p. figs., tables, numerous eqs. **DWB** (510 M615co)—The first and larger part of this text (p.1–266), prepared by D. S. Meyler, gives in 22 chapters and 8 appendices, the basic theories and equations of mathematics and statistics through college or university level, and the last portion (P.269–372) by O. G. Sutton, does the same (in 15 chapters) for the several branches of classical and modern physics, including a chapter (14) on meteorology. The purpose of the book is to give a student boning up for an examination, a broad base of knowledge of math and physics, and also to give the student or worker a handy reference source, for the many fundamental equations and their explanation. No proofs are included. The math section includes arithmetic, theory of equations, algebra, plane and spherical trigonometry, mensuration, analytical geometry, calculus, differential geometry, vectors and statistics, with appended tables of integrals, Bernoulli's and Euler's numbers, sums of infinite series, etc. The Physics section covers mechanics, elasticity, surface tension, fluid mechanics, viscosity, wave motion and sound, light, radiation and spectroscopy, electricity and magnetism, electronics, heat, kinetic theory of gases, atomic physics and meteorology. The last chapter gives a number of basic physical constants and data, plus conversion factors. A detailed 2 page, 2 col. subject index makes the work doubly useful as a reference work. Obviously not too much space can be devoted to each topic in a book covering such a broad field of knowledge. Ample coverage is given to mechanics of solids and electricity and magnetism (23 and 18 p., resp.), to fluid mechanics and light (11 p. each), but only 4 pages to meteorology and 2 pages to acoustics. A similar variety of coverage is found in pure mathematics: ranging from 3 to 23 pages per topic, as listed above. However, the highly concentrated form and wide variety of subjects guarantees that in most cases the treatment is adequate for most students. *Subject Headings:* **1. Mathematical equations 2. Physical equations 3. Mathematical physics handbooks 4. Meteorological formulas.**—*M.R.*

A4. IGY—ARCTIC—ANTARCTIC

See also: **Oceanog. obs. at IGY Wilkes Station** (Tressler), 12.5–155; **Marine studies in offshore waters, Mawson** (Bunt), 12.5 156; **Antarctic divergence and whale feeding grounds** (Beklemishev), 12.5–167; **Low level temp. measurements, Charcot** (Garcia), 12.5–204; **Temp. and circulation regimes, Arctic and Antarctic** (Pogosian), 12.5–214; **"Kernlose" winter, Antarctica** (Wexler), 12.5–397; **Research on chem. tests during IGY** (Piccardi), 12.5–401.

12.5–21 551.506.5(99)

Lugeon, Jean (*MZA, Zurich*), **Rapport préliminaire sur l'expédition polaire suisse de l'AGI à Murchison Bay.** [Preliminary report on the Swiss Polar Expedition of the IGY to Murchison Bay.] *Schweizerische Naturforschende Gesellschaft, Geneva, Verhandlungen*, 137: 72–74, **1957.** 2 foot-refs. **DLC** (Q67.S4) –The establishment of the station by a convention of Sweden, Finland and Switzerland is reported with the first encouraging results on surveying the storms of Siberia, the Baltic and Manchuria. The radio soundings up to 35 km, registering the components of gradient, vertical stream and conductibility, are appraised. The transformation of the temporary station into a permanent one is proposed. *Subject Headings:* **1. Polar expeditions 2. Swiss Polar Expedition 3. Murchison Bay, Arctic.**—*O.T.*

12.5–22 551.506.22(08)

Stonely, R., **The International Geophysical Year.** *Nature*, London, 188(4750):529–532, Nov. 12, **1960. DWB** –This is an account of a symposium on the International Geophysical Year held in Cardiff on Sept. 1, and arranged by Section A of the British Association. R. Stonely opened the discussion with a description of the organization of the IGY, the expenditure and the publication of the data. W. J. G. Beynon discussed the results of ionospheric studies, J. MacDowall gave an account of the Royal Society's Expedition to Halley Bay and G. E. R. Deacon dealt with the oceanographic work. Stonely summed up. This paper details the substance of each of the contributions in turn. *Subject Heading:* **1. IGY symposia** —*R.B.*

12.5–23 551.501.724/.75:551.596.1:551.506.22

Facy, L., **Les sondages acoustiques de la couche chaude pendant l' Année Géophysique Internationale.** [Acoustical soundings of the warm layer during the International Geophysical Year.] *Comité National Français de Géodésie et de Géophysique, Comptes Rendus*, 1958. Issued Paris, **1959.** p. 32–34. **DLC, DWB**—A powerful explosion at ground level produces a shaking of the atmosphere. The acoustic "paths" which meet (at their start) the horizontal at a small angle are refracted toward the ground by a "warm layer" which they encounter at an altitude between 30 and 50 km and their curvature is moreover affected by the wind variations. Perception of the explosion at a distance in the range of 200 km results from these two effects. Statement of the principle of a listening station and of the program for computing the acoustic paths which permit on account of a basis hypothesis, to determine wind and temperature up to their vertex. *Subject Headings:* **1. Acoustical propagation 2. Acoustical temperature determination 3. Acoustical wind sounding 4. IGY acoustical sounding program.**—*A.V.*

12.5–24 551.506.22 551.5:550.3:061.3(73)

Fritz, Sigmund et al., **Status of special studies in meteorology.** *American Geophysical Union, Transactions*, 40(1):57–63, March **1959. DWB**—This report summarizes the aims and findings of the U. S. Weather Bureau series of meteorological studies during IGY. The U. S. Weather Bureau measured solar radiation and long-wave radiation at six stations in Antarctica and on two drifting ice stations in the Arctic Ocean. The ozone concentration at various latitudes and altitudes was measured in continental U. S., Hawii, the Arctic and Antarctic and provides clues to the motions in both layers of the atmosphere. The amount and distribution of CO_2 in the atmosphere were studied by Scripps and Woods Hole. The Naval Research Laboratory and Weather Bureau cooperating with others investigated nuclear radiation and found that, apparently, radioactive decay, gravitational settling, and "scavenging" by precipitation removed the radioactive particles from the air before significant interhemispheric exchange could occur. Aircraft weather reconnaissance in tropical areas provided data which

are being studied. *Subject Headings:* **1. IGY meteorological program 2. U. S. participation in IGY.**—*E.Z.S.*

12.5–25 551.506.22:551.510.53:523.74

Odishaw, Hugh (*Exec. Director of the U. S. Nat'l. Committee for the IGY, Nat'l. Academy of Sciences, Wash., D. C.*), **International Geophysical Year, Pt. 1.** Science, Wash., D. C., 128(3339):1599–1609, Dec. 26, **1958.** 7 figs., table, 5 refs. **Pt. 2.** *Ibid.*, 129(3340):14 25, Jan. 2, **1959.** 11 figs. (incl. photos), table, 4 refs. **DLC**—Summary of IGY activities. Pt. 1 covers three aspects: 1) the discoveries and specific results that can readily be interpreted; 2) the synoptic effort, which yielded vast quantities of data and 3) the direct impact upon future geophysical programs. In the first part, studies concerned with the upper atmosphere and the sun are reported and their details photographically and graphically presented. It is apparent from the report that studies of solar activity, aurora and airglow, cosmic rays, geomagnetism, and ionosphere provided a wealth of data and many concrete, striking findings. The simultaneous observations and measurements, which the IGY emphasized, proved invaluable, while the availability of rocket and satellite vehicles remarkably augmented the information secured from ground stations and observatories, balloons and aircraft. Pt. 2 takes up the story of typical findings in the areas of the heat and water regime (meteorology, oceanography and glaciology) and of the earth sciences (seismology, gravity and longitude and latitude determinations). It also summarizes the status of data flow, for the IGY was above all a synoptic data effort, and then takes a look at post-IGY programs growing out of the IGY. *Subject Headings:* **1. International Geophysical Year, 1957–1958 2. Upper atmosphere research.**—*I.S.*

12.5–26 551.506.7:551.524.7(98)

*†Belmont, A. D., **Upper-air temperatures, 1952–1954.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 63, Vol. 2, Dec. **1959.** p. 11–41. 22 figs., 5 tables, 35 refs. **DWB, DLC**—This paper presents the results of almost 2 years (July 1952 to April 1954) of radiosonde data obtained from Fletcher's Ice Island, T-3, while it drifted a few hundred miles from the North Pole. Temperature-pressure data were processed with a view to obtaining a first estimate of the thermal field near the North Pole throughout the year. The first winter's data (1952–1953), which have been previously summarized (Belmont, 1954), are included in this study. The period of record is too short for significant consolidation of the data, and therefore only individual monthly means of temperature and height by pressure levels are presented and compared with readily available data from other stations. These observations represent the best available radiosonde data from the Central Arctic Basin. Although they can no longer be said to be the first radiosonde data from this area, they are probably the longest consecutive series. The Russian drifting station of 1950–51 (NP 2) took radiosonde observations (291 ascents) from April 15 to Oct. 19, 1950. The individual ascents were published in 1954–1955 and translated into English in 1957 (Somov, 1955). No other summary of those data seems to have been prepared. Later Russian stations have continued upper-air observations, but aside from fragmentary radio transmissions on a daily basis, these observations are not generally available in the West. During the IGY both the U. S. and U.S.S.R. took radiosonde or rawinsonde data from stations on the polar ice. The T-3 data offer us the first chance to examine the monthly, seasonal, and annual variations from the area for a period covering two summers and two winters. *Subject Headings:* **1. Radiosonde data 2. Upper air temperature data 3. Central Arctic Basin.**—*Author's abstract.*

12.5–27 551.507.352 551.506(98)

Reed, Richard J. and Surface, Ronald K., **Arctic weather studies: summer season.** Washington (State). Univ. Dept. of Meteorology and Climatology, Contract AF 19(604)-3063, Scientific Report No. 5, June **1959.** 48 p. 24 figs., 4 tables, 5 refs., 3 eqs. **DWB**—Aircraft reconnaissance reports and 3-hourly surface observations are used to study the relationship between various weather phenomena and features of the Arctic circulation during a three-week period in July 1956. Special series of surface and 500 mb charts had previously been analyzed for the period. The reconnaissance reports were entered at appropriate positions on a large model containing surface fronts, 500 mb low center and 500 mb jet axis, and composites

were drawn of average number of cloud layers, average total cloudiness, average cloudiness in the layers 0–5,000 ft, 5–10,000 ft, 10–15,000 ft, 15–20,000 ft and above 20,000 ft, and average winds and temperatures at 700 mb and 500 mb. The frequency of occurrence of turbulence and icing was also derived. The cloud composites showed a tendency for multiple cloud layers to exist in the flight area and for the total cloud cover to be large. The total cloudiness diminished southward mainly as a result of lesser cloud amounts at low levels (0–5000 ft) over the southern portions of the track. Well away from the coast the amount of stratus was invariably high, though some synoptic variation occurred. The cloudiness at middle and upper levels exhibited a close relationship to surface fronts and to patterns of warm and cold advection aloft. The areas about the occlusion and above and in advance of the frontal wave were marked by greatest frequency of clouds at these levels, while cloudiness was virtually absent in a strip to the rear of the occlusion and in a broad region back of the wave. The regions of warm and cold advection aloft correlated quite well with these cloudy and clear areas, respectively. The individual flight sections were studied in order to determine whether the middle and upper cloud masses were related to the frontal surfaces in the classical fashion. Considerable difficulty was experienced in locating the upper frontal surfaces; but even making allowance for this fact, it appeared that the classical picture usually was violated, the cloud layers tending to be multiple and to possess a smaller angle of slope than the fronts. An example is given of a cross section in which the cloud mass slopes upward along the frontal surface, also a more typical one in which the main cloud deck is more or less horizontal. Turbulence was found to be very infrequent despite the above normal weather activity during the selected period. All reports of turbulence were made in or very near cloud layers. Moderate turbulence occurred once in conjunction with a thunderstorm. Icing was encountered in about one half of the cloud masses both at 700 mb and 500 mb. The plane was in cloud 31% of the time at the lower level and only 13% at the higher. The frontal characteristics, as judged from the 3-hourly surface observations, were highly variable, and little attempt was made to generalize. Probably the best conclusion to be drawn from this part of the study is that the fronts which prevail over the Arctic in summer possess all the variety and complexity of behavior that the forecaster has come to expect of middle latitude fronts. Fog occurred infrequently at inland stations, but was common at many coastal and island locations. The fog formed in air with recent origin over cold water or ice surfaces but with earlier origin in regions of greater warmth and moisture. There was also evidence of a distinct diurnal cycle. Radiation-advection fog would seem the best classification for this fog. A rare instance—connected with a dying occlusion—of a thunderstorm at an extremely high latitude (76°N) was noted. Thunderstorms were not uncommon at certain inland localities, no less than eight being observed at Norman Wells during the three-week period. These occurred in the late afternoon and evening under settled synoptic conditions and hence must be ascribed to insolational heating. *Subject Headings:* **1. Aircraft weather reconnaissance 2. Arctic weather 3. Arctic.**—*Authors' abstract.*

12.5–28 551.589.1(98):551.513.1

†Kunkel, Bruce Arlen, **A synoptic-climatological study of the Arctic circulation in summer.** Washington (State). Univ. Dept. of Meteorology and Climatology, Contract AF 19(604)-3063, Scientific Report No. 7, Sept. 1959. 50 p. 17 figs., 20 refs. **DWB**—Weather analyses used in obtaining earlier estimates of cyclone and anti-cyclone frequencies in the Arctic were, in the absence of sufficient observational data, unduly influenced by the concept of a semi-permanent polar anticyclone. The establishment of drifting ice stations, aerial reconnaissance flights, and additional land stations during the past decade has greatly reduced the data deficiency at high altitudes and has resulted in a corresponding increase in the reliability of synoptic charts for the polar region. The main purpose of the present study is to revise the earlier estimates of cyclone and anticyclone frequencies for the area north of 60 degrees for the summer season, using data for the five years, 1952–56. In view of the very different picture these recent data give regarding the arctic circulation in summer, it was deemed advisable to obtain, in addition, mean monthly sea-level pressures for the five-year period and frequencies of various types of fronts. Principal conclusions are as follows: (1) The inner arctic is a region of high cyclone frequency in summer, the large frequency and great persistence of the lows making this a region somewhat analogous to the Aleutian and Icelandic regions of semiperma-

nent low pressure. The lows in the Arctic Basin have their origin mainly over Siberia and may be attributed to the strong baroclinic zone that develops along the arctic coast in summer. (2) Greatest frequency of anticyclones is found in the zone about 75 degrees north. (3) Earlier ideas regarding mean frontal positions in summer are shown to be seriously in error in the Pacific sector. Instead of a single polar front displaced far northward from its winter position, two belts of high frequency were found, one off Japan and another along the arctic coast. Minimum frequencies occurred in the area formerly believed to be occupied by the polar front. (4) The mean sea-level pressure chart for July 1952–56 shows a center of low pressure at 85°N 180° with a central pressure of about 1005 mb, suggesting the need for further revision of the currently accepted normal pressures for the area. Evidence is offered in support of the view that the period of study was representative of at least the past seventy years. *Subject Headings:* **1. Polar cyclones 2. Anticyclone frequencies 3. Cyclone frequencies 4. Arctic synoptic climatology 5. Arctic.**—*Author's abstract.*

12.5–29 550.387:551.594.5

Hessler, V. P. (*Geophysical Inst., Univ. of Alaska*), **Telluric current micropulsations on Arctic drifting station Charlie.** *Nature*, London, 188(4750):567–568, Nov. 12, **1960.** 2 figs. **DWB**—On Dec. 11, 1959 micropulsations of less than 1 sec (about 70 cycles per minute) were recorded for an interval of more than 2 hr. A quiet auroral arc was observed in the evening of the same day. *Subject Headings:* **1. Telluric current micropulsations 2. Auroral-geomagnetic relationships 3. Arctic**—*R.B.*

12.5–30 551.58:551.324.24(988)

†Fristrup, Børge, **Recent investigations of the Greenland Ice Cap.** *Geografisk Tidsskrift*, Copenhagen, 59:1–29, **1959.** 4 figs., bibliog. p. 24–29. **DWB**—Summarizes the work carried out, especially in the 1950's, during exploration of the Greenland Ice Cap. The discussion is systematically organized, describing first the many expeditions to Greenland and then considering the results of these exploration efforts. The results include information on topography, the total area of the Greenland Ice Cap, the climate of the Ice Cap, snow studies, the temperature in the ice and the regime and the balance of the Ice Cap. Maps showing the seismic surveyings and snow studies and rough sketches of the Ice Cap illustrate the discussion. *Subject Headings:* **1. Greenland Ice Cap geography 2. Climate of Greenland Ice Cap 3. Greenland.**—*I.S.*

12.5–31 551.501.724:551.524.36(99)

Dobryshman, E. M., **Opredelenie minimal'noĭ temperatury v Antarktike.** [Determination of the minimum temperature in Antarctica.] *Meteorologiia i Gidrologiia*, Leningrad, No. 1:21–25, Jan. **1959.** 2 figs., 10 refs., 6 eqs. **DWB, DLC**—Various reports on absolute minimum air temperature in Antarctica are cited and the temperature inversions associated with minimum air temperatures during the polar night are discussed. On the basis of the fact that snow temperature is constant at a given depth and that this may be considered as the mean annual equilibrium temperature, the author develops equations for estimating the absolute minimum temperature that can be expected in Antarctica. On the basis of the equation

$$A(t) \approx A_0 + \sum_{n=1}^{\infty} \frac{A_n}{t_n{}^d} \quad (\alpha_n > 0)$$

it is possible to determine the maximum cooling of surface temperature, if A_0 and T_{mean} are known (T_{mean} = equilibrium temperature at surface of the earth); $A(t)$ = condition of balance of heat energy; $A_0 \approx \mu \lim \bar{T}|_{z=0}$. The equations for the various parameters are presented. It is calculated that the minimum temperature that can occur in Antarctica may be −91° or −92°C. *Subject Headings:* **1. Minimum temperature formulas 2. Absolute minimum temperatures 3. Inversions 4. Antarctica.**—*I.L.D.*

12.5–32 551.506.3:551.521(99)

Thompson, D. C. (*New Zealand Met. Serv.*) and Macdonald, W. J. P. (*Dept. Sci. & Ind. Res., Wellington, New Zealand*), **Radiation balance at Scott Base.** *Nature*, London, 184(4685), Supp. 8:541–542, Aug. 15, **1959.** fig., 3 refs. **DWB**—At Scott Base on Ross Island (77°51′S, 166°48′E) a net exchange radiometer has been in continuous operation since March 1, 1957.

The radiometer measures the difference between the total incoming and outgoing long- and short-wave radiation through a horizontal surface 6 ft above the ground. Along with a description of the site of the radiometer, the present note discusses and tabulates a summary of the first two years, March 1, 1957–Feb. 28, 1958 measurements. *Subject Headings:* **1. Radiation balance data 2. Scott Base, Ross Island, Antarctica.**—*I.S.*

12.5–33 551.510.53:551.524.73(99) 551.524.4(99) 551.515.3:551.578.46(99)

Prudhomme, André, **Notes sur la météorologie Antarctique.** [Notes on Antarctic meteorology.] *La Météorologie*, Paris, Ser. 4, No. 57:11–15, Jan./March **1960. DWB**—This article includes 3 notes on Antarctic meteorology written toward the end of the author's sojourn in Adélie Land (where he died in January 1959) for presentation at the Melbourne Antarctic Symposium in February 1959. The first of these notes concerns diurnal wind variation with altitude. Winds with an E and S component prevail in the lower layers of the atmosphere. The thickness of the lower layers undergoes diurnal and seasonal fluctuations which result in variations of the wind direction and in a modification of the vertical gradient of wind speeds. In the same way radio soundings give evidence of a diurnal variation of W winds in the high troposphere and low stratosphere. The second concerns temperature inversion at low levels. The surface wind and the sea ice play an important part in this phenomenon. The third deals with the "Loewe phenomenon." This phenomenon seems to exist in connection with a low level discontinuity between the winds with a strong S component and winds with more zonal characteristics, from ESE or, more rarely, from W. Radio soundings made of the "Loewe phenomenon" present the following particular characteristics: a layer of strong wind from SSW within the middle troposphere; a relatively warm middle troposphere; a relatively cold low stratosphere and a disturbed tropopause, sometimes split in two. *Subject Headings:* **1. Stratospheric wind variations 2. Temperature inversions 3. Loewe phenomenon 4. Antarctic meteorology 5. Antarctica.**—*A.V.*

12.5–34 551.578.46(99)

Cornet, A.; Lorius, C. and Ricou, G. (*all, Centre National de la Recherche Scientifique, Paris*), **Accumulation de neige en Terre Adélie.** [Snow accumulation in Adélie Land.] *La Météorologie*, Paris, Ser. 4, No. 57: 171–184, Jan./March **1960.** 4 figs., 2 tables, 2 refs. French, English, Spanish and Russian summaries. **DWB**—Account of measurements made during investigation on the Antarctic continent in the course of the IGY in order to determine the accumulation of snow in Adélie Land. Frequency and form of precipitation as well as the forms of accumulation (snow barchan, crescent shaped drift, large accumulation drift, ripple-mark) and the forms of ablation (snow anvil, sharply etched) were studied. The part played by various factors, such as the distance from the coast and the altitude and slope of the ground, were determined. Along the coastal zone, the ablation exceeds the accumulation by a water value of 17 cm but this phenomenon disappears at an altitude of about 200 m. The maximum accumulation (50 to 60 cm water per year) appears between 900 and 1200 m altitude. A rough zone stretches as far as the last important recognized border of the Central Antarctic plateau. The average water accumulation of 30 cm undergoes a sudden decrease at each steep slope. Finally, a flat zone begins at about 275 kms from the coast and at an altitude of 2340 m. The accumulation diminishes regularly by 6 cm water for each 100 km and seems to reach zero towards 500 km. *Subject Headings:* **1. Snow accumulation 2. Snow drift profiles 3. Ablation 4. Adélie Land, Antarctica.**—*A.V.*

12.5–35 551.506:551.326.7(99)

Tomashunas, B. Ia., **Ledovye nabliudeniia.** [Ice observations.] *Sovetskaia Antarkticheskaia Ekspeditsiia, 1955–*, [*Materialy*], Vol. 5, issued Leningrad **1959.** p. 154–158. 3 figs. (1 fold.), foot-ref. **DLC**—Observation of ice by the Second Antarctic Expedition was carried out to determine: (1) characteristics of general ice conditions in the region of the Expedition's activities, (2) The effect of ice on weather formation and (3) conditions of ice and its changes, especially in approaches to Antarctic coasts and in areas where the unloading of ships was planned (near Mirny). The work consisted of visual observation of ice fields and icebergs, measurements of their thickness and preparation of maps with the assistance of 12 air surveys. Specific characteristics of ice (16) are listed and methods of observation and measuring are

described in detail and map in view of construction of ice roads between the ship and station Mirny. General characteristics of ice and location of icebergs and ice packs are marked on a second map from Princess Ragnhild Coast (20°S long.) to Mirny near the Shackleton Ice Shelf (100°E long.). Various positions of the floating ice fields from November to April are marked on a third map. The icebergs continuously moving under effect of predominant wind and current have considerable role on the destruction of the ice field. *Subject Headings:* **1. Glaciological observations 2. Ice drift calculations 3. Antarctic ice 4. Antarctica.** *N.P.S.*

12.5–36 551.506.5:91.04(99) 551.326.7(99)

Ono, Nobuo, **The ice around Showa-base in Antarctica.** *Low Temperature Science, Ser. A, Physical Sciences*, Sapporo, Japan, No. 18:179–187, **1959.** 3 figs., 8 plates, 8 refs. In Japanese; English summary p. 186–187. **DWB, DLC**—The present writer participated in JARE-3 (Japanese Antarctic Research Expedition III) in charge of oceanographic observations, and stayed at Ongul Island (where the Japanese Wintering Base "Showa" is situated) during the period Feb. 1–4. Several specimens of ice were collected and brought to Japan. Specimens were taken from icebergs, pond-ice of Ongul Island, surface ice of puddles, fast ice and pack ice. Fig. 1 shows the position of Ongul Island and the track of the ship. Plate II-3 is an aerial photograph of Ongul Island by JARE-1; the positions of sample collections are shown. Plate I-1 is a horizontal section of pack ice which was photographed under dispersed light. Sizes of grains are similar to those of sea ice off the Okhotsk coast of Hokkaido and in the Arctic. Plate I-2 is a thin section of iceberg ice under dispersed light. The sample was taken from a very small anchor iceberg near the base. It was about 4 or 5 m in height. On Ongul Island there are several ponds without surface ice and much lingering snow. The largest pond of East-Ongul Island is shown in Plate IV-7. Near the pond holes in the snow (Plate III-4 & 5), ripple marks (Plate IV-6), and ice needles (Plate V-8) were seen. Under the snow there was hard ice (Plate V-9) which is considered to be frozen ice of pond water. It has slender cylindrical air bubbles (Plate VI-11); in those bubbles, new ice was observed at −20°C in cold room. Plate VII-12 shows the new crystals in a bubble. Plate VII-13 is a thin horizontal section of the upper part of pond ice. Disk-like air bubbles and RTyndall figures were observed in this section. Plates VI-10 and VIII-14 directions of c-axis was observed and plotted on a Schmidt's net (Fig. 2). In these observations the c-axis of the pond ice was found generally lying in horizontal direction. Plate VIII-15 is a vertical section of surface ice on a puddle; granular crystal structure with spherical small air bubbles was observed. *Subject Headings:* **1. Japanese Antarctic expeditions 2. Ice properties 3. Ice crystal studies 4. Showa Base, Ongul Island, Antarctica.**—*Author's abstract.*

12.5–37 551.506.7(99) 551.509.1 551.509.317

Moreland, W. B. (*U. S. W. B.*), **The Weather Central at Little America (Inside Antarctica No. 3)**, *Weatherwise*, Boston, 11(6):196–200, Dec. **1958.** 4 figs., photo, ref. **DWB**—Representatives of the U. S., Argentina, Australia, France, New Zealand, S. Africa, and the U.S.S.R. cooperated under CSAGI in the staffing of the IGY-Antarctic Weather Central in 1957–58. The Mother-Daughter communication network in force in 1958 is shown on a chart. Reports were collected at McMurdo Sound and relayed to the Weather Central, starting in late June 1957. Small stations reported 3 times daily and large stations 8 times a day. Broadcasts from other Southern Hemisphere countries were collected at Little America. Collectives were broadcast by the Weather Central 4 times daily and upper air and surface analyses once a day. On June 3, 1957 facsimile maps were sent from Little America direct to Washington, D. C. by radio. Four surface charts, two 700–500 and 300 mb charts and one 50 mb chart were made each day. *Subject Headings:* **1. IGY Antarctic Weather Central 2. Antarctic weather observations.**—*M.R.*

A5. SERVICES—SOCIETIES

See also: **Weather Central, Little America** (Moreland), 12.5–37.

12.5–38 551.506.8(43)

Witterstein, Franz, **Bedeutung und Aufgaben des Phänologischen Dienstes.** [Significance and tasks of the Phenological Service.] *Germany. Deutscher Wetterdienst, Mitteilungen*, 3(19), **1960.** 22 p. 6 figs., 2 tables, 14 refs.—This is an exposition of the study of phenology.

The essential features and objects of phenology are explained. The methods used, the post system, the collection of data, the programming and the preparation of reports of phenological observations are followed by a discussion of the value and application of such observations. *Subject Headings:* **1. Phenological services 2. Germany.**—*E.Z.S.*

12.5–39 551.5:623.5

U. S. Naval Ordnance Test Station, China Lake, Calif., **Weather services provided by the Atmospheric Studies Branch.** Its *NOTS* 2010, May 1, **1958.** 32 p. figs., photos, tables. **DWB** -A booklet describing and illustrating the surface and upper air observations made by the Atmospheric Studies Branch of the U. S. Naval Ordnance Test Station at China Lake, Calif., (35°41′N, 117°41′W, 2215 ft elevation) together with the instruments or equipment and the forecast services, consultation and climatology service, and the evaluation and development services. The rugged topography of the station and Mojave Desert —Mt. Whitney region is shown on a map. Instruments are located at 16 points on the aircraft ranges, ground ranges and track ranges and at Armitage Field. Equipment includes that for measuring pressure, temperature, wind, humidity, sky, visibility, precipitation, solar radiation, atmospheric density, vapor pressure, speed of sound, upper air pressure, temperature, humidity, density and wind, etc. *Subject Headings:* **1. Naval Ordnance Test Station Weather Service 2. Ballistic missile testing meteorological instrumentation 3. Military meteorology weather services 4. China Lake, Calif.**—*M.R.*

12.5–40 551.509.1:621.397.9

Weber, Omar, **Die Verwendung von Faksimileapparaten im Wetterdienst.** [Employment of facsimile equipment in a meteorological service.] *Schweizer Aero-Revue*, Zurich, 35(6): 357–358, June **1960.** 5 figs. **DLC**—The determination of atmospheric situations necessitates a plotting of weather charts and diagrams; the decoding of hundreds of different messages by specialized assistants. From the beginning of synoptic meteorology this work has been carried out in a central office and the charts transmitted by wireless to the other services. Since 1955 the Swiss meteorological service has employed facsimile equipment of the Hellfax type with very good results for receiving and transmitting; the transmitted image is received directly on paper and is immediately available. The author gives a technical description of the Swiss equipment. *Subject Headings:* **1. Facsimile map transmission 2. Swiss Meteorological Service 3. Switzerland.**—*A.V.*

12.5–41 551.5:061.1(480)

Burkova, M. V. and Timofeev, M. P., **Meteorologicheskaia sluzhba Finliandii.** [Meteorological Service of Finland.] *Meteorologiia i Gidrologiia*, Moscow, No. 6:38–40, June **1960.** 5 refs. **DWB, DLC**—The activities of the Central Meteorological Institute and other similar organizations in Finland (Hydrological and Oceanographic Institutes) are reviewed by the authors with descriptions of the field of operation, instrumentation, publication of reports and synoptic maps. The Meteorological Institute has the following divisions: climatology, precipitation, synoptics, aerology, aviation, meteorology and geophysics. Among specific investigations the following are mentioned: measurements of heat flow in air and ground, effective frost prevention measures for agriculture, improvement of aerological instruments, aviation climatological investigation of factors affecting fog formation, etc. Among general meteorological services are mentioned popularization of meteorological information, synoptic maps and weather forecasts through the press and by television. *Subject Headings:* **1. Finnish Meteorological Service 2. Finland.**—*N.P.S.*

12.5–42 551.5:061.2(439.1)

Dési, Frigyes, **A magyar meteorológia időszerű kérdései és nemzetközi vonatkozásai.** [Current problems and international relations of Hungarian meteorology.] *Időjárás*, Budapest, 63(6):365–366, Nov./Dec. **1959. DLC**—Physical, biological and mathematical basic research are evaluated as current problems of Hungarian meteorology, emphasizing that today's science will become tomorrow's technique. The immediate needs of industry and agriculture are served by the Agrometeorological and Medical branches of the Hungarian Meteorological

Society. The improvement of international relations inside the Socialist camp is stressed by the achievements of the recent meteorological conference at Szmolenice, at which Budapest was chosen as the seat of a conference dealing with the meteorological effects of the Carpathian area. *Subject Headings:* **1. Meteorological societies 2. Hungary.**—*O.T.*

A6. CONFERENCES—SYMPOSIA

See also: **IGY** (Stonely), 12.5–22; **Hydromet. Service, Estonia** (Stirnov), 12.5–188; **Conference on Long Range Weather Forecasting, China** (Dobrysham), 12.5–231; **Sixth All-Union Cloud Conf.** (Aleksandrov), 12.5–342.

12.5–43 551.507.362(08):061.3

†International Astronautical Congress, Rome, Sept. 17–22, 1956, **Proceedings of the 7th Congress.** Issued Rome, 1956. 927 p. Also **Proceedings of the 8th Congress, Barcelona, Oct. 6–12, 1957.** Issued Vienna, Springer Verlag, 1958. 607 p. numerous figs., refs. and eqs. in both vols. (Pertinent articles abstracted separately.) **DLC** (TL787.144)—The present compilation consists of the papers read during the 7th Astronautical Congress organized by the National Association (A.I.R.) under the direction of the International Federation (I.A.F.). It includes thirteen papers on the subject of artificial satellites, covering the various aspects, i.e., its minimum weight, launching, its eventual camouflage, orbit and irregularities of motion, the interplanetary matter within which it is moving, and the temperature arising therefrom. Thirteen other papers relate to the space vehicles and the rocket techniques in general. There are also four papers on celestial mechanics, four papers on space physiology, four on interplanetary travels and one on the possibility of interstellar travels. The contributors are from the U. S., England, Germany, Austria, Holland, Sweden, Poland, Egypt, Argentina and Italy. *Subject Headings:* **1. International Astronautical Congress, 7th, Rome 1956 2. Astronautical Conferences.**—*I.S.*

12.5–44 551.510.53:061.3(08)

Singer, S. Fred, **Symposium on the Physics of the High Atmosphere.** *U. S. Office of Naval Research, London, Technical Report,* ONRL-133-52, Dec. 16, **1952.** 8 p. 5 refs. **DWB**—A symposium was held in Belfast to consider problems arising out of high atmosphere research. In this century, the study of atmosphere has been conducted with the aid of radio signals. Studies show the influence of the earth's magnetic field on phenomena in upper atmosphere. The role of rockets in high altitude physics was described by SINGER. BATES spoke on the problem of effecting a reconciliation between physical theories and the vast amount of uncertain experimental data. The discussions gave an impression of lack of advanced knowledge in fundamental features effecting atmosphere. *Subject Headings:* **1. Physics of the atmosphere symposia 2. Upper atmosphere research.**—*A.H.K.*

A7. EDUCATION, HISTORY AND BIOGRAPHY

EDUCATION

See: **Teaching of met.** (Kolokol'nikov), 12.5–10.

HISTORY

See also: **Cause of aurora borealis** (Batcher), 12.5–129; **Hist. of climat., Lithuania** (Griciute, Styra), 12.5–370.

12.5–45 551.501:551.575(09)

Baliles, M. D. (*Office of Climatology*), **History of observational instructions on fog.** *U. S. Weather Bureau, Key to Meteorological Records Documentation,* No. 3.031, **1959.** 8 p. **DWB**—A chronological documentation of U. S. Weather Bureau instructions issued for observing and recording fog from 1891–1958. Types of fog considered were light, moderate, dense, heavy, thick, ground fog, ice fog. The criteria or limits of visibility involved, time of beginning or ending and specifications for recording a "day with fog" or "foggy" on forms 1001, 1083, 1030.

Subject Headings: **1. History of fog observation instructions 2. Fog observation instruction 3. U. S. Weather Bureau.**—*M.R.*

12.5–46 551.510.4:551.574.11(0

Verzár, F., **The discovery of atmospheric condensation nuclei by Paul-Jean Coulier in 1875 : a historical note.** *Experientia*, Basel, 15(9):362–363, Sept. **1959.** fig., 18 refs. Germa summary p. 363. **DLC**—Paul-Jean Coulier, born in Paris on Aug. 31, 1824, should b remembered as the first who showed with simple methods, the existence, the role and most o the basic facts of atmospheric condensation nuclei. The present article discusses Coulier' contribution, referring to his paper [**Note sur une nouvelle propriete de l'air**], which appeare in the *Journal de Pharmacie et de Chimie* (Ser. IV, 22, 165, Sept. **1875**) (*see* 6H–2 and –3, Aug 1955, *Met. Abs.*). A facsimile of the first page of the article is reproduced here. It is pointe out that in spite of the great value of John Aitken's work on atmospheric condensation nucle as the cause of haze, fog, and clouds, all the basic observations were made without Aitken' knowledge several years before by Paul-Jean Coulier, professor at the Val de Grâce, th military and pharmaceutical school of Paris. *Subject Headings:* **1. Atmospheric nuclei 2. Con densation nuclei theories 3. History of nuclei research.**—*I.S.*

Biography

12.5–47 551.5:9

Dufay, Jean, [**Obituary of**] **Jean Cabannes, 1885–1959.** *Annales d'Astrophysiqu* Paris, 23(4):499–503, July/Aug. **1960.** photo. **DLC.** Also, **Note** in *L'Astronomie*, Pari 74(6):281–284, June **1960.** photo. **DLC**—After ending his studies at the training colleg for a professorship in Paris, Cabannes became professor at the Faculty of Sciences in Mon pellier, and then professor at the Sorbonne, where he became the dean of the Faculty of Science (1946–1949). He was a member of the Academy of Sciences of Paris. He undertook seve ral missions abroad and played an important part in spreading the renown of Frenc science. His considerable scientific work deals principally with optics, spectroscopy an molecular physics. Besides these fields, he made a first order contribution to atmospheri optics, and thereby to astrophysics. In this part of his work the investigations wer particularly directed to the fields of atmospheric diffusion and absorption, atmospheric ozone nightglow spectrum, atmospheric sodium, interferential measurements and forbidden line in the sun's absorption spectrum. *Subject Headings:* **1. Biography of Jean Cabanne 2. Cabannes, Jean.**—*A.V.*

12.5–48 551.5:9

Tardé, Pierre, [**Obituary of**] **R. P. Pierre Lejay.** *Annales de Géophysique*, Paris, 15(2) 125–133, April/June **1959.** photo. **DLC.** Also: Tardé, Pierre, [**Obituary of**] **Rev. Fathe Pierre Lejay.** *Académie des Sciences, Paris, Comptes Rendus*, 247(17):1265–1270, Oct. 27 **1958. DWB, DLC.** Also: Decaux, B., [**Obituary of**] **Pierre Lejay.** *L'Onde Électrique* Paris, 39(384):162–166, March **1959. DLC**—Father Pierre Lejay was born on June 11 1898 near Toulon, France. Tardé recalls the brilliant scientific career of the deceased an his research in astronomy and in the different branches of geophysics and geodesy. H acquired the title of Doctor in Mathematical Sciences in 1926. He went through a course a the Ecole Supérieure d'Electricité and directed his studies towards scientific radioelectricity Later he became President of the International Scientific Radio-Union. He was simultaneousl interested in geodesy (more particularly astronomy and gravimetry) and in geophysics especially the upper atmosphere, the ionosphere and scientific radioelectricity. He died o the night of Oct. 10–11, 1958 on board the "Flandre" on which he was returning from the VIIt General Assembly of the International Council of Scientific Unions which had been held i Washington, Oct. 2–6. The article by Decaux is a detailed account of Father Pierre Lejay. *Subject Headings:* **1. Obituary of Pierre Lejay 2. Lejay, Pierre.**—*A.V.*

12.5–49 551.5:9

[**Obituary note**] **on Maria Zschetzschingck, May 23, 1880–March 31, 1958.** *Meteoro logische Rundschau*, Berlin, 11(3):100, May/June **1958. DWB, DLC**—Maria Zschetz schingck became an assistant of Hugo Hergesell in 1896, when as director of the Meteoro

logical Service of Alsace-Lorraine he began to organize international cooperation for upper air observations. She became secretary of the International Commission of Aeronautics and in 1914 she was appointed business manager of the Prussian Aeronautics Observatory, a post which she retained until 1926. Subsequently she became librarian of the German Upper Air Weather Central and in 1933 her publication **Aerological observations on International Days between Nov. 1900 and Aug. 1914** appeared. When the library of the Aviation Weather Service was combined with that of the Prussian Meteorological Institute to become the Weather Service Library she continued as librarian. *Subject Headings:* **1. Obituary of Maria Zschetzschingck 2. Zschetzschingck, M.**—*I.L.D.*

Bibliographies

See: **Cloud physics bibliogs.** (Battan), 12.5–329.

B. APPLICATIONS

B1. AERONAUTICS

See also: **Forecasting mist fog and low stratus, Oslo airport** (Tandberg), 12.5–229; **Daytime fog clearance, Exter airport** (Saunders), 12.5–230; **Jet condensation trail shadows** (Lokke), 12.5–345.

12.5–50 551.508.762:551.508.92:551.591.6

Sperry Gyroscope Co., Great Neck, N. Y., **An operational flight evaluation of an approach zone slant visibility measuring system.** Constant AF 19(604)-1372, Sperry Report No. 3245–4080 (summary report), May **1957.** Each section repaged. 3 refs. 11 figs., 2 tables—The performance of the approach zone slant visibility measuring system developed during the Sperry-ANDB program at MacArthur Field has been evaluated operationally in an accelerated service test at Newark Airport. The system for determining slant visibility involves meteorological measurements by ceilometer and transmissometer, photometric measurements by terrain illuminometer and horizon photometer, and relationships combining these measurements with visual data for the human pilot based on flight observations. The evaluation has been accomplished by documenting approximately 1400 airline pilot reports of initial visual runway threshold contact during instrument approaches at Newark between Nov. 1955 and Nov. 1956. These data have been compared with threshold contact heights computed by means of the slant visibility measuring system. The results expressed statistically indicate that, for ceiling weather conditions, between 42% and 58% of the approaches obtain runway threshold contact prior to reaching the altitudes computed on the basis of slant visibility with a 50% probability level. The general meteorological relationship for the variation of atmospheric slant transmission with range, which is required for the determination of slant visibility and which has been developed at MacArthur Field for ceiling weather conditions, is applicable to Newark Airport, and may be extended to other airports. The fog-smoke-haze weather conditions during the day may be satisfactorily represented as a homogeneous atmosphere for the determination of slant transmission. The fog-smoke-haze weather condition at Newark at night, however, produces an atmosphere in which slant transmission is not aptly represented by the assumption of homogeneity; larger variation in the computed range of values of slant visibility is to be expected under these conditions. The visual illuminance threshold for the pilot, which is required for the determination of slant visibility based on threshold lights, is affected by the intensity of the approach light system. Higher approach light intensity settings result in higher illuminance thresholds which cause reductions in slant visibility to the runway threshold for a given threshold light intensity. *Subject Headings:* **1. Visibility measurement techniques 2. Slant visibility measuring system 3. Newark Airport, Newark, N. J.**—*Author's abstract.*

12.5–51 551.509.317:629.13

Kogan-Beletskiĭ, G. I., **Otsenka usloviĭ poleta na bol'shoĭ vysote.** [Evaluation of high-level flight conditions.] *Meteorologiia i Gidrologiia*, Moscow, No. 4: 10–16, April **1960.** 3 figs., ref., eq. **DWB, DLC**—The technical flight characteristics of aircraft flying at high altitudes are related to the conditions of the Standard Atmosphere. Under actual conditions

the flight characteristics are altered owing to the substantial deviations of temperature pressure, and density of the atmosphere from their hypothetical values in the Standard Atmosphere. In estimating the influence of meteorological factors on the ceiling of an aircraft it is necessary to consider not only the temperature deviations from the Standard Atmosphere which give only the variations of barometric altitudes, but also to know the absolute height of the ceiling above sea level; and if the height of the aircraft above sea level is known the true height of the ceiling can be determined from the absolute height above sea level. The barometric and absolute heights are calculated with the aid of an aerological diagram. The variation of the ceiling height as a function of temperature deviation from the Standard Atmosphere temperature is calculated by means of the equation $P_{rp}=1/[1+h_t(\delta T/T_{cT})]P_{cp}$ for altitudes of 11–20 km and plotted on an aerological diagram as a sloping, slightly curved line. The barometric height of the ceiling in the Standard Atmosphere is designated by circles on the line of the temperature distribution in the Standard Atmosphere. If data of temperature soundings are plotted on the diagram, then at the point of intersection of the curve of stratification with the barometric height of the ceiling for a particular type of aircraft and load, it is possible to obtain the corrected value of the ceiling by taking into account the atmospheric temperature deviation from the hypothetical Standard Atmosphere. With the aid of an aerological diagram and maps the author discusses an example of the actual computation of an airplane ceiling and the absolute heights of a ceiling for an extensive temperature sounding and the distribution of ceiling heights for an aircraft for Aug. 1959 over Western Europe and the Soviet Union. *Subject Headings:* **1. Meteorological influences on aircraft ceiling 2. Forecasting ceiling heights 3. Western Europe 4. U.S.S.R.**—*I.L.D.*

12.5–52 551.509.5:551.576.4:551.591:629.1

Munn, R. E., **A graphical method for forecasting ceiling and visibility as applied to Torbay Airport, Newfoundland.** *Royal Meteorological Society, Canadian Branch, [Publications]*, 6(8) Oct. 7, **1954.** 16 p. 6 figs., 7 refs., append. **DWB**—The synoptic maps for the five-year period 1949 to 1953 are used to extract Torbay ceilings and visibilities, and the five associated variables—time of year, time of day, geostrophic wind speed isobaric direction and curvature. Two hundred and eighty-eight graphs are drawn relating the variables. Comparative tests are made with the subjective forecasts issued for Torbay by the Main Meteorological Office at Gander. The conclusion is reached that the graphs are of value. *Subject Headings:* **1. Ceiling and visibility forecasting 2. Torbay Airport, Newfoundland.**—*Author's abstract.*

12.5–53 551.510.53:629.13:061.

Veranneman, N. L., **High-level analysis and forecasting techniques for long-haul turbine-powered aircraft.** *World Meteorological Organization, WMO Bulletin*, 8(3):138–139, July **1959** photo. **DWB**—A panel of experts on high level analysis and forecasting, met in Brussels in March 1959. Many recommendations were made. These recommendations related to checking the upper air temperature, reducing the systematic errors affecting radiosonde observations, etc. It was decided to pool the efforts on jet stream research. *Subject Headings* **1. Upper air research 2. Forecasting techniques for turbine-powered aircraft.**—*N.N.*

B2. ASTRONAUTICS

See also: **Rocket around the moon** (Ehricke, Gamow), 12.5–109; **Investigation with the 3rd Soviet satellite** (Kurnosova), 12.5–118; **Radiation intensity observed by U. S. satellite 1938α** (Miyazaki, Takeuchi), 12.5–119; **Ionizing radiation at altitudes of 3,500 36,000 km Pioneer I** (Rosen et al.), 12.5–120; **Radiation belts created by Argus experiments, 12.5–142.**

12.5–54 551.507.362.1:623.454.8:523.

Singer, S. Fred (*Physics Dept., Md., Univ.*), **Interplanetary ballistic missiles: a new astrophysical research tool.** *Astronautica Acta*, Vienna, 4(1):59–69, **1958.** 2 tables. French English and German summaries p. 59–60. **DWB**—The purpose of the present paper is to show that the explosion of an H-bomb carried to the moon by means of a missile is completely feasible and approximately equal in difficulty to the firing of an ICBM (Intercontinenta

Ballistic Missile) with an H-bomb warhead; to show that it is desirable from the point of view of testing, and worthwhile scientifically. These three factors combined, in the author's opinion, make such a project highly desirable. Most of the paper is devoted to the many astrophysical applications of this new research tool; the legal and geopolitical aspects of this operation are beyond the scope of this paper. *Subject Headings:* **1. Interplanetary rocket flights 2. Missile flight.**—*Author's abstract.*

12.5–55 551.506.7:551.507.362.2

Clarke, Janet B., **Technical parameters of satellites 1958 Delta and 1958 Epsilon.** *Smithsonian Institution. Astrophysical Observatory, Special Report*, No. 18:3–4, Oct. 4, **1958.** table. **DWB.** Reprinted in *IGY, 1957/1958. IGY World Data Center A, Rockets and Satellites, IGY Satellite Report Series*, No. 8:65–66, June 15, **1959.**—The data for Sputnik III and its carrier rocket, and for Explorer IV are presented in a table, including launching date and time; ejection point; initial period, apogee and perigee, inclination, initial eccentricity; size, radio transmission, mass-area ratio and scientific equipment carried. Lack of information on the Russian satellite made it necessary to infer its mass-area ratios through speculation methods and theoretical deduction. The initial values of orbital elements were derived from several observations extrapolated backward also, and thus are not based solely on observations of the day of launching. *Subject Headings:* **1. Soviet satellite 1958 Delta (Sputnik III) 2. U. S. satellite 1958 Epsilon (Explorer IV).**—*O.T.* Ⓢ

12.5–56 551.507.362.2:525.14

Buchar, Emil (*Astron. Inst., Czech Technical Univ., Prague*), **The motion of the orbital node of Sputnik 2 (1957β) and the oblateness of the earth.** *Studia Geophysica et Geodaetica*, Prague, 2(4):306–321, **1958.** 4 figs., tables, 8 refs., 27 eqs. Russian summary p. 321. **DWB**—The oblateness of the earth has the effect that apart from the period perturbations of the motion of the satellite not only the line of apsides rotates in the orbital plane but also the nodal line rotates in the equatorial plane. Equations are presented for determining the geocentric position and nodal line of the second Soviet satellite. The formulas give the positions of the ascending node of the orbit of the satellite with an error of $\pm 0.18°$ per determination from visual observations. The period of observations exceeded 4 months so that the motion of the nodal line exceeded 390°. By means of the equation of positions of the node grouped in 7 normal places there was derived a numerical expression representing the dependence of daily movement of the node upon time. The theoretical value of the velocity of motion of the node was derived from the basic Lagrange equation of the variation of constants. In the expansion of the perturbation function consideration was given to the terms containing the Legendre polynomial of the fourth order and the fourth power of the eccentricity of the orbit. In calculating the nodal motion attention was paid also to the radial component of the disturbing force. From the motion of the node determined on the basis of observations and with auxiliary quantities the difference in moment of inertia of the Earth was calculated for 8 moments in the whole period of observations and they were in good agreement with the results obtained by lunar motion. The mean relative error in this determination was a fraction of 0.0012 of the total value. From the difference in moments of inertia the oblateness of the earth was computed, namely: $\alpha + 1/297.90 \pm 0.18$. *Subject Headings:* **1. Satellite orbits 2. U.S.S.R. satellite, 1957β (Sputnik II) 3. Earth's shape.**—*Author's conclusion and I.L.D.*

12.5–57 551.507.362.2:526.7

Merson, R. H. and King-Hele, D. G. (*both, Royal Aircraft Establishment, Farnborough*), **Use of artificial satellites to explore the earth's gravitational field: results from Sputnik 2 (1957β).** *Nature*, London, 182(4636):640–641, Sept. 6, **1958.** 2 figs., 6 refs., 8 eqs. **DWB**—Discussion of the gravitational field of the earth, for which some tentative conclusions are drawn, based on comparison between theoretical and observational findings. The theoretical value of mean rate of rotation of the orbital plane Ω for Sputnik 2, and values of other orbital elements based on kinetheodolite data from Finland are involved. Variations with time of theoretical and observed Ω values are in close agreement as shown in graph. *Subject Headings:* **1. Satellite orbit data 2. Gravity measurement techniques 3. Soviet satellite, 1957 Beta (Sputnik II).**—*W.N.*

12.5–58 551.507.362.2:521.312

Jacchia, L. G. and Briggs, R. E., **Orbital acceleration of satellite 1958 Beta two.** *Smithsonian Institution. Astrophysical Observatory, Special Report* No. 18:9–12, Oct. 4, **1958.** fig., table, 4 refs. **DWB.** Reprinted in *IGY, 1957/1958. IGY World Data Center A, Rockets and Satellites, IGY Satellite Report Series*, No. 8:67–70, June 15, **1959.**—The results of the analysis of 1450 Minitrack observations made between March 17 and Sept. 16, 1958 by Project Vanguard, as reduced to the subsatellite point program, are presented. The rhythmic variation of acceleration, periodicity and fluctuations are evaluated. Perigee passage, anomalous period, and orbital acceleration are shown in table. Time variation of anomalous period and orbital acceleration are also illustrated in diagrams. *Subject Headings:* **1. Orbital acceleration of satellites 2. U. S. satellite, 1952 Beta 8 (Vanguard I).**—*O.T.*

12.5–59 551.507.362.2:621.398

Matthews, Whitney and Ludwig, George H., **Satellite telemetry.** *American Geophysical Union, Transactions*, 39(1):187–192, Feb. **1958.** 2 figs., table. **DWB, DLC** –Telemetering systems of the U. S. nonrecoverable satellites are designed for direct observations in space, to record observations made by the satellite's instruments, to encode such observations for transmittal to ground stations and to accomplish the actual transmission. In this U. S.-IGY program accuracy and reliability are the watch words and the embodiment of the transmission system is wrapped up in two packages, viz: the Lyman-alpha and the cosmic ray packages, which are internationally studied by a chain of stations in the U. S., as well as at strategic points overseas under a volunteer telemetering recording system. *Subject Headings:* **1. Satellite tracking 2. Telemetering systems.**—*N.N.*

12.5–60 551.507.362.2

Väisälä, Vilho (*Inst. of Met., Univ. of Helsinki*), **Tracking the satellite 1957a2≫Sputnik≫ by means of the Finnish radiotheodolite.** *Geophysica*, Helsinki, 5(4):216–220, **1958.** 5 figs., 2 tables, 2 refs. **DWB, DLC.** Also issued as: *Helsinki. Universitet. Meteorologiska Institutet, Mitteilungen*, No. 84, **1958.**—A radio theodolite at the Vaisala Oy testing station (60°28′N) near Helsinki was converted from 24–25.6 Mc to 40 Mc/s to follow the first Sputnik. Equipment, antennas and 4 passages as calculated for the night of Oct. 11–12, 1957 are illustrated. Data for 12 passages in October 1957 are tabulated. Time of revolution (95.79 ±0.01 min) and height (270–390 km) are given. *Subject Headings:* **1. Satellite tracking 2. Soviet satellite, 1957 Alpha 2 (Sputnik I) 3. Radio theodolite satellite tracking 4. Helsinki, Finland.**—*M.R.*

12.5–61 551.507.362.2:551.521

Heller, Gerhard (*U. S. Army Ordnance Missile Command, Redstone Arsenal, Ala.*), **The Explorer: the Explorer story and the temperature control of the satellite package.** *Franklin Institute, Phil., Journal . . . Monograph*, No. 6:89–113, Dec. **1958.** 31 figs., table. **DWB** (629.1388 F832te)—After a review of the preparatory research and work involved in putting the Explorer into orbit, its instrumentation is discussed with stress on the temperature as determined by four modes of radiation: (1) Direct radiation from the sun; (2) Reflected solar radiation; (3) Infrared radiation from earth and (4) Infrared radiation from the skin of the satellite. The results are presented in several graphs and demonstrate the success of the method applied for heat protection which is discussed in some detail. *Subject Headings:* **1. Satellite temperatures 2. U. S. satellite, 1958 Alpha (Explorer I).**—*W.N.*

12.5–62 551.508.21:551.521:551.507.362.2

Chubb, T. A.; Friedman, H. and Kupperian, J. (*U. S. Naval Res. Lab., Wash., D. C.*), **A Lyman alpha experiment for the Vanguard satellite.** (In: Van Allen, James A. (*ed.*), **Scientific uses of earth satellites.** Ann Arbor, Univ. of Michigan Press, **1956.** p. 147–151. 2 figs., 6 refs.) **DWB, DLC**—Lyman alpha measurements to determine relation of sudden ionospheric disturbances to solar flares and radio fadeouts will be made with equipment developed by N.R.L. and tested several times in rocket flights. The system weighs <600g and has an operating life of >500 hours. It measures a narrow range of spectrum from 1100

to 1340 A, where 95% of the solar radiation is concentrated in the hydrogen Lyman alpha line. Wiring, storage device for information, orbital relations, etc. are described and illustrated. *Subject Headings:* **1. Lyman alpha radiation measurements 2. Satellite radiation equipment.** —*M.R.*

12.5–63 551.521:551.507.362.2:521.312

Wing, Lawrence D. (*Martin Co.*), **Evaluation of thermal problems at relatively low orbital altitudes.** *Aero Space Engineering*, N. Y., 19(3):58–60; 64, March 1960. 3 figs., 3 refs., 10 eqs. **DLC**—An orbiting vehicle is exposed to and affected by the direct shear radiation, the solar radiation reflected off the earth and atmosphere, as well as by the energy that is radiated from the earth. A fourth heat source is the internal heat produced within the vehicle. All these create some relatively large temperature fluctuations within. The report outlines a simple way of estimating the maximum and minimum heat inputs experienced anywhere on the outer skin face of an orbiting vehicle. This is easily the best method of ascertaining whether a designer should continue with further digital computations that would involve the orbit, the construction materials and structural fabrications. *Subject Heading:* **1. Temperature of orbiting satellite.**—*N.N.* Ⓢ

12.5–64 551.508:551.510.536:542.636

Patterson, R. T. (*Glenn L. Martin Co., Baltimore*), **Vertical recovery.** *International Astronautical Congress, Proceedings of the 8th Congress, Barcelona, 1957*, issued Vienna, 1958. p. 285–299. 14 figs., 2 tables. English, German and French summaries p. 285. **DLC** (TL787.I44)—This report presents the results of a study to determine the feasibility of recovering scientific-research payloads from very-high-altitude, near-vertical trajectories. It cites emulsions as an example of a research payload which must be recovered for developing and analyzing. The report then considers the parameters which define a recoverable payload; the features which govern the payload's structure; the design of the various payload components; and, finally, it considers other problems associated with recovery. It concludes that the recovery of such a scientific-research payload is feasible today. *Subject Headings:* **1. Payload recovery 2. Space testing equipment.**—*Author's abstract.*

B3. RADIO COMMUNICATION

12.5–65 551.510.62:551.576.1(263)

†Harrington Edward L., **Cloud refractive index studies, Pt. 3.** Chicago. Univ. Dept. of Meteorology. Cloud Physics Lab., Contract AF 19(604)-1931, Final Report, May 2, 1960. 93 p. 50 figs. (incl. photos), 15 tables, 4 refs. (For abstract on Pt. 1, *see* 10.6–312, June 1959 and for Pt. 2, *see* 10.9–178, Sept. 1959, *Met. Abs.*) **DWB** (M74.1 C532te)—Statistical analysis of refractive index gradients has been applied to some measurements made in the subcloud layers at altitudes from 1,000 ft to 3,000 ft over the Caribbean Sea. The data were arranged in bivariate frequency tables of ΔN versus ΔS and tests were made to determine if these distributions changed with respect to altitude and horizontal location, and to see if the distributions representing cloud air were different from the clear-air distributions. The tests revealed a high degree of sampling variability which masked any other variability which might be present. The distributions of ΔN show that over ninety per cent of the values are less than one N unit, reflecting the high humidity encountered at these altitudes. Autocorrelograms of three low-altitude passes are inconclusive because lag sizes were too large to detect the gradient activity and the records were too short for meso-scale variation to be verified. The correlogram for a record of data gathered entirely in clear air showed high positive correlation over a distance of approximately 28 km. The integrated refractive index change along the aircraft flight path in cloud has been computed for a number of clouds from both the subtropical oceans and the continental United States. The mean behavior of this integral function is shown for the tropical ocean clouds. A difference in the size distribution of the integral function between the ocean and continental clouds is examined and attributed to a biased sampling of the ocean clouds with respect to cloud-environment refractive index difference. Gross refractive index measurements have been made on additional cloud samples. *Subject Headings:* **1. Refractive index in clouds 2. Caribbean Sea.** —*Author's abstract.*

12.5–66 551.510.52:551.510.62

Millington, G., **Propagation at great heights in the atmosphere.** *Marconi Review*, London, 21(131):143–160, **1958.** 9 figs., 10 refs., 62 eqs. **DLC**—This article considers tropospheric propagation over the earth through an atmosphere which is standard at small heights but in which the refractive index approaches unity asymptotically at great heights. The departure from the linear decrease leads in the geometric-optical region to a reduced horizon distance and in the diffraction region to a reduction in height-gain. The latter may be interpreted as an equivalent change in distance which is found to be effectively independent of frequency and identical with the decrease in horizon distance. It follows that the shape of the propagation curve as a function of distance is maintained and that the important thing to establish is the position of the horizon for the assumed model of the atmosphere. The theory is illustrated by using a refraction index that decreases exponentially to unity. *Subject Headings:* **1. Tropospheric radio wave propagation 2. Refractive index.**—*Author's abstract.*

12.5–67 551.510.62:621.396.029.6 538.566

†Koch, G. F., **Die verschiedenen Ansätze des Kirchhoffschen Prinzips und ihre Anwendung auf die Beugungsdiagramme bei elektromagnetischen Wellen.** [Different methods based on Kirchhoff's principle and their applications to the refraction diagram in the case of electromagnetic waves.] *Archiv der Elektrischen Übertragung*, Stuttgart, 14(2):77–98, Feb. **1960** and 14(3):132–153, March **1960.** 39 figs., 53 refs., 221 eqs. German and English summaries. **DLC**—Following a brief review (Sec. I) of the possibilities of accounting analytically for the diffraction problems encountered at microwave frequencies, a short outline (Sec. II) is given of the methods using the statement of KIRCHOFF, which have most practical importance, and the methods are applied for diffraction at a diaphragm and at a disk (reflector). The results are stated for the far field of the diffraction wave in the illuminated and nonilluminated spaces of diaphragm and reflector with the scalar methods of KIRCHHOFF, the two scalar methods of SOMMERFELD, the vectorial method of FRANZ, and the two vectorial methods of LUNEBERG. The features of these methods, of which under certain conditions the vectorial methods yield the same results as the corresponding scalar methods, are pointed out and their differences studied in detail (Sec. III). On the basis of experimental results the capabilities of the various methods are checked, above all with oblique incidence, for in this case the differences between the various methods are far greater than with vertical incidence, and the influence of the polarization makes itself felt far more strongly, whereas with vertical incidence it is but slight. The so-called revolving-mirror test allows a simple presentation of the diffraction diagrams with vertical incidence, and permits conclusions to be drawn with respect to the diffraction diagrams with oblique incidence in the plane of incidence. A direct measurement of the diffraction diagrams with oblique incidence confirms these conclusions: furthermore the value of the results of the methods is studied with reflectors of the order of several wavelengths, as well as the influence of the polarization of the incident wave. The investigations showed as a rule a superiority of the scalar statement of KIRCHHOFF and the vectorial statement of FRANZ, in particular with cases of oblique incidence, which are critical with respect to polarization. The experimental investigations, which were only made for the plane incidence, also allow conclusions to be drawn with respect to the capabilities of the methods outside the plane of incidence, however (Sec. IV). From the results of the experiments Sec. V draws some conclusions for the handling of Kirchhoff's approximation methods. In Sec. VI consideration is given to the reflection at reflectors of the order of a few wave lengths, investigations and calculations are stated concerning the surface utilization and conclusions are drawn from the capabilities of the approximation methods as to the calculation of the reflecting cross-sections of plane reflectors. *Subject Headings:* **1. Microwave propagation 2. Electromagnetic wave refraction 3. Kirchhoff's principles 4. Refraction diagram.**—*Author's abstract.*

12.5–68 551.510.62:621.396

†Wait, James R. (*Natl. Bur. of Standards, Boulder, Colo.*), **A study of VLF field strength data, both old and new.** *Geofisica Pura e Applicata*, Milan, 41:73–85, **1958.** 16 figs., bibliog. p. 83–85, 2 eqs. **DLC**—Employing some old data of ROUND et al. and the recent data of HERITAGE et al., attenuation rates at VLF are deduced. For middle latitudes, daytime rates of less than 2 db per 1000 km of path length are not uncommon. These are in general accord

with values derived from spheric waveforms and they are compatible with mode theory. An extensive bibliography is appended. *Subject Heading:* **1. VLF field strength.**—*Author's summary.*

12.5–69 551.594.6:532.59:621.396.9

Taylor, William L. and Lange, L. Jerome (*both, Nat'l. Bur. of Standards, Boulder, Colo.*), **Some characteristics of VLF propagation using atmospheric waveforms.** *Conference on Atmospheric Electricity, 2nd, Portsmouth, N. H., May 1958, Proceedings,* issued **1958.** p. 609–617. 6 figs., 6 refs., 3 eqs. **DWB** (M(055) C748pr)—Simultaneous observations have been made of the waveforms of atmospherics ("sferics") at four widely separated stations. VLF attenuation characteristics have been computed by comparing the spectra of the waveforms recorded at the four locations for each discharge. The results of some preliminary measurements of VLF attenuation are presented for the band of frequencies from 4 kc to 30 kc at distances of 1200 km to 6500 km. *Subject Headings:* **1. VLF radio wave propagation 2. Sferics wave forms.**—*Authors' abstract.*

12.5–70 551.501.81:551.510.535:551.594.12

Dueño, Braulio (*Univ. Puerto Rico*), **Peculiarities and seasonal variations of transequatorial backscatter echoes as observed at Mayaguez, Puerto Rico.** *Journal of Geophysical Research,* Wash., D. C., 65(6):1691–1698, June **1960.** 8 figs., 5 refs. **DLC**—As a result of a backscatter experiment on 21.6, 40.68, and 49.68 Mc/s, it has been observed that long-range transequatorial echoes, which are most prevalent during the equinoxial periods, also exhibit a minimum of transequatorial activity during the solstitial periods June, July and December, January. The mechanism for the production of long-range transequatorial echoes (LRTE) is not well understood. Comparison of our data with National Bureau of Standards propagation predictions suggests that the echoes may result from the combined action of the evening equatorial bulge and sizeable concentrations in electron density at the north and south edges of the bulge. The large concentration of electron density in the north edge occurs over Bogota and is easily observable in the late evening hours on the 40- and 50-Mc/s channels at slant ranges slightly under 4000 km. From experimental evidence it is deduced that the angle of arrival of LRTE echoes is quite low and that the propagation mode is such that the wave stays a short fraction of its total path in the ionosphere. From the experimental data it is also anticipated that a 60-Mc/s backscatter radar would see LRTE activity for a very small fraction of time. At this point it is well to concede that backscatter results are on the pessimistic side if compared with ordinary one-way transmissions used in communication circuits. *Subject Headings:* **1. Transequatorial backscatter echo variations 2. Long range transequatorial echoes (LRTE) 3. Mayaguez, Puerto Rico.**—*Author's abstract.* Ⓢ

B4. AGRICULTURE

See also: **Climat. zones of viticulture, U.S.S.R.** (Davitaia), 12.5–8; **Spring weather and measures for protecting vineyards from frosts, Ala Tau Mts.** (Bogun, Fedoseev), 12.5–236; **Unusual early frosts, Crimea** (Burtsev), 12.5–295; **Wind protection in marshlands** (Uhlig), 12.5–310; **Precip. measurement in apple orchards** (Hoffmann), 12.5–349.

12.5–71 551.586:551.573:631.55

Savina, S. S., **Ispol'zovanie zavisimosti urozhaia ot defitsita isparenііa v otsenke effekta melioratsii.** [The indicator of melioration effect based upon the relationships between harvests and evaporation deficit.] *Akademiia Nauk SSSR, Ser. Geog.,* No. 1:75–80, Jan. **1960.** 4 figs., 2 footnotes, 8 refs., 2 eqs. **DWB**—An attempt to appraise the benefits (increased productivity) derived from artificial irrigation in drought areas where evaporation rates are high. Tests made in small and large sectors give variable results depending upon a variety of local differences. *Subject Headings:* **1. Evaporation deficit-crop yield relationships 2. Irrigation effects on crop yield.**—*E.Z.S.*

12.5–72 551.579:551.573:631.67:633.63:633.491

*Cavanillas Rodríguez, Luis; Valías Gómez, Enrique and Maravall Casesnoves, Darío, **Experiencias sobre riego de remolacha azucarera y patatas años 1947 a 1953.** [Experiments on irrigation of sugar beets and potatoes, 1947–1953.] *Spain. Instituto Nacional de In-*

vestigaciones Agronomicas, Anales, 5(4):595–775, Dec. **1956.** 8 photos, numerous figs., tables and eqs. **DLC** Reports on experiments on irrigation of sugar beets and potatoes includes reference to rates and amounts of evapotranspiration. *Subject Headings:* **1. Evapotranspiration losses 2. Irrigation 3. Sugar beets 4. Potato cultivation.**—*E.Z.S.*

12.5–73 551.508.79:551.579.5

Marais, P. G. and Smit, W. B. De V., **Neutron moisture meter. Circuit diagram and operation.** *South African Journal of Agricultural Science.* Pretoria, 3(1):115–130, March **1960.** 5 figs., 2 plates, 2 tables, 19 refs. English, Afrikaans and French summaries p. 125–127. **DA**—The circuit diagram of the neutron moisture meter described in this paper is simple, reproducible and employs standard components which may be easily replaced without affecting the meter's response. The use of a high-gain pre-amplifier in the probe unit eliminates the need for a cathode follower. Overloading of the main amplifier results in pulses of sufficient amplitude and duration and tenders unnecessary a pulse-shaping network for driving the scaler. It gives rise also to a plateau in the counting rate against high voltage curve and at this plateau the counting rate is relatively independent of the discriminator bias. At voltages across the BF_3 counter exceeding the plateau value, gamma ray pulses are also recorded, resulting in a rapid rise in counting rate. This rise can be prevented by using a Po-Be source, emitting no gammas, but it has the disadvantage of a short half-life. It was considered preferable to employ a Ra-Be source and by selecting suitable operating conditions to eliminate the effect of gamma rays. The high and discriminator voltages are variable making the instrument more versatile so that any BF_3 counter may be employed. By using an accumulator and genemotor rather than dry batteries the running expenses are reduced. The resolving time of the instrument is approximately 50 microseconds and for counting rates normally encountered in soil studies no correction for counting losses in necessary. Statistical analyses showed the meter to be functioning correctly. *Subject Headings:* **1. Soil moisture measurement techniques 2. Neutron moisture meter.**—*Authors' abstract.*

12.5–74 551.509.612:551.524.31:631.544.4:582.734

*†Boodley, James V. and Seeley, John G., **Some effects of adjusting night temperatures on growth of greenhouse roses.** University Park, Pa., Agricultural Experiment Station, May **1960.** 8 p. 4 figs., 7 tables, 12 refs. "Progress Report 218." **DWB** (630.61 P415pr) —The rose varieties Better Times, Golden Rapture, Peter's Briarcliff, and Lily White were grown under standard and adjusted night temperature conditions for four seasons at University Park, Penn. During the first three seasons, night temperatures were reduced to 55°F following cloudy days. In the fourth season night temperatures were increased to 65° following clear days. A control section of the greenhouse was maintained at 60° night temperature regardless of the previous daily light conditions. Reducing the night temperature to 55° after cloudy days reduced the flower production and the rate of plant growth without any compensating increase in keeping quality of the flowers. Increasing the night temperature to 65° after clear days, did not improve the flower production over the standard night temperatures. Results for the fourth season are not to be considered conclusive since this study was conducted in a single season only and this was not a full productive season. On the basis of these experiments, it appears desirable to maintain the standard night temperatures during the winter, and spring, regardless of the previous daily light intensity. *Subject Headings:* **1. Greenhouse temperature variations 2. Night temperature effects on greenhouse roses 3. Rose cultivation.**—*Authors' abstract.*

12.5–75 551.509.612:551.524.371:632.111.5

Peyer, E., **Bericht über die Massnahmen zur Frostwehr im Jahre 1959, im Wein-, Obst- und Gartenbau und in der Landwirtschaft.** [Report on frost protection during 1959 in the wine, fruit and vegetable cultivation regions.] *Schweizerische Zeitschrift für Obst- und Weinbau*, Wadenswill, 69(8):191–192, April 16, **1960.** fig. **DA**—Review of results and disappointments in the field of frost protection during 1959. Abstract of the publication of the biological service of Berlin-Dahlem. Vineyards: sprinkling system has been generally abandoned. Heating system has given good results at Baden-Württemberg (700 Ha). Ventilation has

given good results in the Southern Tirol; in Germany, the system is not favorable. Borax sprinkling has been inactive. Fruit tree cultivation: Good results with sprinkling system. Heating system has given different results; the system is very difficult for small areas. The article also considers the cost of the different systems of frost protection. *Subject Headings:* **1. Frost protection 2. Smoke screens 3. Sprinkling 4. Ventilation 5. Heating systems.** —*A.V.*

12.5–76 551.584.6:681.614

Jackson, Allan A. (*Dept. of Horticulture, Wye College, Univ. of London*), **The eco-climatology of Dutch lights, Pt. 1, Meteorological assessment.** *Weather*, London, 14(4):117–123, April **1959.** 3 figs., 5 tables. Also: **Pt. 2, The effect on growth.** *Ibid.*, 14(5):155–162, May **1959.** 2 figs., 5 tables, 4 refs. **DWB, DLC**—Pt. 1 –About 1¼ million Dutch lights (cold frames) are used in England. Detailed micrometeorological records were kept in connection with crop production in a block of these frames at Wye College, Kent, in the winter and spring of 1953–54. Outside vs. inside temperatures are discussed (average 2.3°F, highest 5°F on real cold nights). Soil temperatures are also noted. They produce a lag which carries over the results of previous day's sunshine to the following night. Maximum temperatures in Dec. were as high as 68°F, or 15°F more than in the Stevenson screen. On March 11, 1954 the temperature reached 92°F at 3″ height, or 32°F higher than the screen maximum. On a clear night the range may be 56°F. Cumulative temperature differences are also discussed and illustrated. Pt. 2 –It was previously stated that the "Dutch lights" cold frames act in the same manner as a windbreak but that there is also a more fundamental improvement of growing conditions. The effects of minimum, maximum, soil temperatures and accumulated temperatures were discussed. In this part of the report consideration is given to the significance of the climate differences in the air and in the soil. The dates of cutting, ventilation, snow effects, the use of reed mats to cover the frames and wind effects are described. The test results for temperature accumulation in relation to time of cutting lettuce grown in frames, thermograph traces, 3 inches above the soil level, made inside and outside cold frames in March, hours of sunshine in relation to time of cutting, the effect of snow on the air minimum at 3 in. in Dutch lights, comparison of air minima at 3 in. in frames, frames with mats and outside, and the relationship between wind and air maximum temperature in the frame are given. The important part played by the glass in preserving an ecoclimate free from wind and so creating higher day temperature has been discussed. In addition, it is pointed out that the frame preserves the crop from direct wind damage. The experimental lettuce crop used was the variety known as "May Queen." *Subject Headings:* **1. Frame microclimatology 2. Dutch lights 2. Soil temperatures 4. Wye College, Kent, Eng.** —*M.R., E.Z.S.*

12.5–77 551.584.4:633:551.524:551.571

Muminov, F. A., **Temperatura i vlazhnost' vozdukha na poliakh s razlichnymi sel'skokhoziaĭstvennymi kul'turami.** [Air temperature and humidity in fields with various agricultural crops.] *Sredneaziatskiĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, No. 2(17):175–184, **1959.** 5 figs., 4 tables, 3 refs. **DWB** (M(055) U581ts)—The results of observations on atmospheric temperature and humidity in fields with various agricultural crops such as lucerne grass, potatoes and maize are presented. The observations were carried out over the period July 8 26, 1957 in Uzbekistan. The measurements were made with aspirating psychrometers at heights of 20, 50 and 100 cm above the soil. Tables and graphs giving the diurnal variations of atmospheric temperature and relative humidity with heights in fallow, potato, maize and lucerne fields; the mean diurnal atmospheric temperature and relative humidity at different heights in fallow potato, maize and lucerne fields; atmospheric temperature distribution with height for comparable sections of the various fields; daily variation of absolute humidity over the different fields averaged for July and daily variations of soil temperature. *Subject Headings:* **1. Field microclimatology 2. Micrometeorological temperature measurements 3. Humidity in fields 4. Uzbek S.S.R.**—*I.L.D.*

12.5–78 595.72:551.509.52:551.509.54

Kraus, E. B. (*Snowy Mts. Hydro-Electric Authority, Cooma North, New South Wales*), **Meteorological aspects of desert locust control.** *UNESCO, Arid Zone Research*, 11:211–216,

pub. 1958. fig., 12 refs. French summary p. 216. **DWB** (M84 U58cL)—Rainfall and wind forecasts as a possible help in locust warning and control, and difficulties in preparing such forecasts in arid regions are discussed in general terms. Micrometeorological effects upon the application of insecticides and environmental effects upon the development of locusts are also considered. *Subject Headings:* **1. Locust control 2. Rainfall and wind forecasts in locust control 3. Insecticides 4. Arid regions.**—*G.T.*

B5. FORESTRY

See also: **Subterranean recharge of rivers of forest and forest steppe zone** (Bogoliubov), 12.5-180: **Cross-section of trees as related to wind** (Gerashchenko), 12.5–309.

12.5–79 551.584.41:551.524.4:551.554(473)

Rauner, Iu. L., **Nekotorye rezul'taty teplobalansovykh nabliudeniĭ v listvennom lesu.** [Some results of heat balance observations in a deciduous forest.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geog.*, No. 5:79–86, Sept/Oct. **1958.** 5 figs., table, 3 refs. **DWB**—The author presents the preliminary results of special actinometric and gradient observations in a three-storeyed forest made at the Zagorsk IGY station of the Institute of Permafrost of the Academy of Sciences of the U.S.S.R. (85 km north of Moscow and 15 km northwest of Zagorsk). The character of the forest, including the component tree species, height and age of trees, soil and soil moisture, the meteorological tower set up in the forest, the installation of meteorological apparatus and the observation procedure are described. The vertical distribution of air temperature above a forest on clear and cloudy days is shown on a graph. Superadiabatic gradients are established at 1800 o'clock and disappear after 1700 o'clock. A well developed inversion becomes established at 1830 o'clock which continues all night. The maximum vertical temperature difference along a 16 m layer on clear days is 0.90 C. The vertical distribution of wind velocity over the forest shows an exponential character; within the crown the velocity diminishes sharply since a break occurs near the upper end of the crown expanse. The roughness parameter (z_0) was 2 m and the mean value of $d=0.45$ and $H=7.0$ m (where d = thickness of displacement layer). The equation for turbulent heat flow is

$$P=0.116u_1(T_2-T_3)[1+a(T_2-T_3/V_1^2)]$$

where V = wind velocity; T = temperature; a = constant for a given z_0, index "1" refers to 26.5 m; index "2" to 32.0 m and index "3" to 16.5 m above the soil surface. The heat exchange in the biomass is given by $B_D=c:h\cdot\Delta T$ where c = mean total heat capacity of the woods; h = mean thickness of layer of heat exchange and ΔT = increment of air temperature within the crown for one hour. The heat and moisture exchange over a forest on clear days shows a maximum near midday when the heat exchange attains almost 0.30 cal/cm² min. At night there is advection of heat from the atmosphere. Heat exchange in the tree stand (B_D) has a maximum and minimum in the morning and evening, respectively. Precipitation influences considerably P (turbulent heat exchange) and LE (evaporation from soil and transpiration). Data on the totals of the elements of heat balance and the daily variation of these elements are presented in a table and in graphs. *Subject Headings:* **1. Heat exchange in forests 2. Forest micrometeorology 3. Vertical temperature gradient 4. Zagorsk IGY Station, Moscow Region, U.S.S.R.**—*I.L.D.*

12.5–80 551.524.3:551.573:551.579.5:634.94

Rauner, Iu. L., **Teplovoĭ balans lesa.** [Heat balance of a forest.] *Akademiia Nauk SSSR. Izvestiia, Ser. Geog.*, No. 1:49–59, Jan. **1960.** 7 figs., 3 tables, 4 footnotes, 11 refs., 6 eqs. **DWB**—In considering the heat balance in a forest—both heat exchange and moisture exchange must be taken into account. Soil moisture conditions should not be ignored. Derivation of the mathematical formulas are given and graphical representations are made showing the correlation. *Subject Headings:* **1. Heat exchange in forests 2. Moisture exchange.**—*E.Z.S.*

12.5–81 551.584.41:551.524.4(497.1)

Handžić, Mustafa (*Sarajevo*), **Mikroklimatološka mjerenja u šumama Romanije kod Sarajeva.** [Microclimatological measurements in the Romanija forests near Sarajevo.]

Zagreb, Yugoslavia. Hidrometeorološki Zavod NR Hrvatske, Raspreave i Prikazi, 8(4):65–77, **1959.** fig., 2 folded graphs. Serbo-Croatian and English summaries p. 65. **DWB**—In this paper micrometeorological measurements in the forests of Romanija near Sarajevo (Bosnia) are described. They were carried out during several summer days with standard meteorological instruments. The Meteorological Institute at Sarajevo constructed a shelter for installing the instruments. The treatment of the data of the observations are limited to the observing of changes of temperature in the surface layer of air 2 m thick. An inverse and increasing gradient state is prominent as well as their changes in the diurnal march of the various kinds of forests with regard to their vegetation. *Subject Headings:* **1. Forest influences on temperature 2. Forest microclimatology 3. Sarajevo, Yugoslavia.**—*Author's abstract.*

12.5–82 551.584.41 551.577.52:551.588.6

Fel'dman, Ia. I., **Les i klimat.** [Forest and climate.] *Priroda*, Moscow, No. 5:93–95, May **1959.** foot-refs. **DLC**—Results of a study of the influence of forests in a forest zone of the European U.S.S.R. on local summer weather types in which rainy or at least cloudy skies are prevalent. The study, carried out according to the method of complex climatology, showed that the presence of woods brings about two tendencies in the formation of weather with precipitation. On the one hand there is a tendency to increase the recurrence of rainy weather connected with frontal processes, on the other hand there is a tendency to lower the number of cases of rainy weather with daytime clouds and precipitation occurring as a result of "intramass" convective processes. It can be asserted that in the forest zone of the U.S.S.R. the precipitation amount does not depend on the extent of woodlands. At the same time the influence of forests on the increase of the number of rainy and cloudy days indicates that forests contribute to the moistening of the lowest air layer. *Subject Headings:* **1. Forest influences on weather 2. Forest microclimatology 3. European U.S.S.R.**—*A.M.P.*

12.5–83 551.5:632.187

Berg, Alan B. and Lowry, William P., **Fire weather studies on Bald Mountain.** *Oregon. Forest Lands Research Center, Corvallis, Research Note*, No. 39, June **1959.** 59 p. 28 figs. (incl. photos), 5 tables, eqs. **DWB**—A weather observation network consisting of eleven stations established in the area surrounding Bald Mountain Lookout in the Coast Range of Polk County, Oreg., reveals that the weather station at the Lookout does not adequately represent the complex weather pattern in the Bald Mountain area. Observations of temperature, relative humidity, fuel moisture, and wind on east and west slopes at intermediate elevations and in the Valsetz Basin tend to disagree with the weather station on Bald Mountain. Observations in local areas tend to agree. Descriptions of five selected individual days during the 1955 fire season based on an analysis of the values of the potential temperature, the mixing ratio, and the wind, reconstruct the local weather patterns in the Bald Mountain area. The study illustrates the problems the fire weather forecaster and the forester in fire control face in interpreting weather data. *Subject Headings:* **1. Fire weather studies 2. Bald Mt., Oreg.**—*Authors' abstract.*

12.5–84 551.501.771:662.63 551.508.71

Wilson, G. U. (*Central Office, Melbourne*), **Some sources of error in psychrometric readings and calculations.** (In: Fire Weather Conference, Melbourne, Australia, July 1958, **Proceedings,** issued Melbourne, **1958.** Conference Paper, No. 1, (9 p.). 2 tables, 3 refs.) **DWB**—The importance of temperature and the saturation deficit of the air in determining fuel inflammability and fire behaviour is discussed briefly. Because foresters and other workers in fire research and fire weather research make extensive use at present of air temperature and relative humidity, the sources of error in the measurement and calculation of these elements are reviewed. Estimates are made of the magnitude of the errors introduced. The most serious sources of error in relative humidity calculations are those arising from variations in the speed of ventilation of wet bulb thermometers. In extreme cases, errors as high as 15% may result. The use of aspirated psychrometers is recommended for precise measurements of temperature and humidity in any investigational work into the relationship between these elements and the moisture content of fuels. *Subject Headings:* **1. Moisture content of fuels 2. Psychrometer errors 3. Aspiration psychrometers.**—*Author's abstract.*

12.5–85 551.501.771:662.63 632.18

Wilson, G. V. (*Central Office, Melbourne*), **Some problems of estimating and predictin moisture content of forest and grass fuels.** (In: Fire Weather Conference, Melbourn Australia, July 1958, **Proceedings,** issued Melbourne, **1958.** Conference Paper, No. 3 (9 p. 3 tables, 6 refs.) (Reproduction of p. 138–146 from unidentified source.) **DWB**—Th moisture content of fuels influences their inflammability and the behaviour of fires. Thu the assessment and prediction of fuel moisture content is necessary when planning measure to protect against fire outbreak and to control existing fires. Hazard sticks are used in man forestry centres to determine the fuel moisture content. The several weaknesses of the metho are discussed. It is possible that the assessment and prediction of fuel moisture content can b made directly from the measurement and quantitative forecasts of certain meteorologica elements. The micrometeorological and microhydrological problems involved in the suggeste method are discussed in detail but no attempt is made to offer a solution to the problem at th stage. *Subject Headings:* **1. Moisture content of fuels 2. Forest fire control.**—*Author abstract.*

12.5–86 551.509.21:551.553.

Clarke, R. H., **Midsummer diurnal winds in the southeast of South Australia.** (In: Fir Weather Conference, Melbourne, Australia, July 1958, **Proceedings,** issued Melbourne, **1958** Conference Paper, No. 14 (19 p.). 11 figs., 6 tables, 5 refs.) (Reprinted by courtesy Divisio of Meteorological Physics, C.S.I.R.O.) **DWB**—In a region where diurnal wind regimes ar pronounced, fire fighting authorities may be expected to have a vital interest in knowing an using the diurnal cycle as an aid in short term wind prediction. Any statistics, therefore which can assist in such prediction, or can reduce the forecast error, should be of interes The present investigation discusses some statistics of the diurnal wind in southeast Sout Australia. A prediction diagram is suggested for the sea breeze in the Mount Gambier area *Subject Headings:* **1. Short range diurnal wind forecasting 2. Diurnal wind regime 3. Sout Australia.**—*Author's abstract.*

B6. INDUSTRY

See also: **Increase of emissions in an industrial city, Central Germany** (Rassow), 12.5 249; **Method of estimating heating degree days** (McGrew), 12.5–294; **Wind power station in a non-wind power system** (Akaev), 12.5–311; **Wind: its irregularity** (Petry), 12.5–312.

12.5–87 533.6.07:551.551:551.510.42:628.5

Strom, Gordon H.; Hackman, Murry and Kaplin, Edward J. (*all, N. Y. U.*), **Atmospheri dispersal of industrial stack gases determined by concentration measurements in scale mode wind tunnel experiments.** *Air Pollution Control Association, Proceedings,* Vol. 50, **1957** Issued **1958?** Paper No. 20 (6 p.). 6 figs., 7 refs. **DWB** (M10.42 A298ap)—Wind tunne scale model experiments are more useful when performed with sulfur dioxide concentratio equipment. In application to air pollution problems of industrial plants the effects of plan configuration and stack parameters can be evaluated more effectively. Since tolerance of ai pollutants is often expressed in terms of concentration values, direct measurement of con centrations in model experiments gives a more meaningful result. Correlation of wind tunne experiments with field studies will be more significant with this quantitative form of data Increased use and confidence in scale model experiments will depend on significant correlatio studies. (Run from another source as 10.8–184, Aug. 1959, *Met. Abs.*) *Subject Headings* **1. Diffusion of stack effluents 2. Wind tunnel experiments.**—*Authors' abstract.*

12.5–88 551.321.6:551.324.3:551.578.4

Stearns, S. Russell, **Snow beams and abutments using Peter snow.** *U. S. Snow Ice and Permafrost Research Establishment, Technical Report,* 55, Feb. **1959.** 6 p. 8 figs. **DWB DLC**—The results are reports of a pilot study in August 1957 at Site 2, Greenland, to determin the feasibility of roofing a plowed trench 8 ft wide with beams cut from Peter snow, to study the deflection of the roof beams, and to test Peter snow abutments under direct vertical load Tapered beams 8 ft long were cantilevered over the trench to a distance of 4 ft singly and in

opposed (haunched) pairs, with and without slush cementation at the median joint. The single cantilever beam showed a linear time-deflection relation, with a deflection rate of 3.15 cm/hr under severe loading and flexural stress of 1.5 kg/cm² without immediate failure. The haunched beam without slushed center joint behaved similarly, the 2 halves apparently acting as individual beams. The deflection rate was 1 mm/hr for the first 3 days, decreasing to 0.7 mm/hr for the last 8 days. The deflection curve for the double slushed beam was similar to that of a plastic material. A rapid but decreasing deflection rate was recorded the first day, becoming constant at 1.58 mm/hr after 20 hr. The computed allowable abutment loading was 1150 lb/ft using a safety factor of 2 and the smallest failure load measured in 4 tests. *Subject Headings:* **1. Snow beams and abutments 2. Peter snow 3. Greenland.** —*Author's abstract.*

12.5–89 620.92:551.521.1

Schlichtig, R. C. and Morris, J. A., Jr. (*both, Elec. Res., Boeing Airplane Co., Seattle, Wash.*), **Thermoelectric and mechanical conversion of solar power.** *Solar Energy*, Phoenix, Ariz., 3(2):14–18, April **1959.** 4 figs., 9 refs. **DWB** It has been frequently demonstrated that solar energy can produce power by its direct heating effect. It has previously been overlooked, however, that sunshine stores vast amounts of free energy in the atmosphere by lowering its relative humidity, particularly in desert areas. The presently described equipment is a composite of a solar collector, a thermoelectric generator, and a mechanical converter which will generate power from waste heat and stored free energy of dry atmospheric air. The mechanical converter is unusual in its simplicity, its flexibility, and its capability to use small temperature differentials, Although the mechanical converter is described as associated with a reflecting solar collector, field tests may show the mechanical converter to be more practical without the collector, in which case air of the greatest usefulness would be collected from the surface of the solar heated ground by a grid of air ducts. Several cycle variations are possible with the same basic machine, which uses air as the working substance. Although the use of salt or fresh water for evaporation improves the power output, the mechanical converter will operate without evaporating water if water cannot be obtained. *Subject Headings:* **1. Solar energy 2. Thermoelectric generators 3. Mechanical conversion of solar energy.** —*Authors' abstract.*

B7. MEDICINE AND HEALTH

See also: **Effective temps., U.S.S.R.** (Milevskiĭ), 12.5–387; **Med. climat.** (Mörikofer), 12.5–390; **Bioclimat. studies, Leiden** (Tromp), 12.5–391; **Cooling power and thermal radiation, Baltic Sea Coast** (Grimm), 12.5–392; **Outdoor weather-comfort index for summer reason, Hartford, Conn.** (Hendrick), 12.5–393; **Blood sedimentation** (Giordano), 12.5–394; **Temp. and radiation as comfort factors** (Berg), 12.5–395.

12.5–90 551.586:551.510.42:616–006.6

Mancuso, Thomas F. (*Div. of Industrial Hygiene, State Dept. of Health, Columbus, Ohio*), **The relation of air pollution and cancer.** (In: National Conference on Air Pollution, Wash., D. C., Nov. 1958, **Proceedings,** pub. **1959.** p. 221–227.) **DWB** (M10.42 N277pr) —The evidence of an "urban" factor for lung cancer distinct from smoking patterns, or questions of classification or diagnosis, appears to be proven. This excess in urban areas for lung cancer increases by size of city, when smoking patterns are held constant; and varies by geographical areas. A color difference in the urban areas of the nonwhite over the native white as well as total white males for lung cancer also occurs even though the smoking patterns of the white are much greater and, finally, the native white male mortality rate for lung cancer is over 100% greater in urban areas than in rural areas. There is also evidence that the foreign born lung cancer rate of immigrants from England and Wales to New Zealand may be related to environmental factors such as air pollution. It is concluded that air pollution represents a highly probable and important factor in the excess of lung cancer in urban areas, acting directly and augmenting the occupational exposures of men, so that carcinogenic and co-carcinogenic agents of both environments may be involved. *Subject Headings:* **1. Human climatology 2. Atmospheric pollution effects on cancer 3. Cancer and weather.**—*I.S.*

12.5–91 551.586:551.510.42:612.014.4

Nelson, Norton (*N. Y. Inst. of Industrial Medicine, New York*), **The irritant action of air pollutants.** (In: National Conference on Air Pollution, Wash., D. C., Nov. 1958, **Proceedings,** pub. 1959. p. 210–214.) **DWB** (M10.42 N277pr)—For eye irritation and as contributors to respiratory difficulty in major air pollution disasters, the importance of air pollutants is obvious. However, the relationship to general health impairment of these irritant materials in the more moderate concentrations in larger cities is still uncertain. The present discussion is limited to this latter problem. The materials found in general community air which merit inclusion in the category of irritants are enumerated. Since both the nature and the extent of the biological response are modified by the relationship between the physical and chemical properties of the irritants and the structure and responsivity of the lung, these factors are discussed at length. It is concluded that air pollutants may cause dynamic changes in the functioning of the lungs as well as tend to define the organic dosage to the lung tissues. *Subject Headings:* **1. Medical meteorology 2. Atmospheric pollution and health.**—*I.S.*

12.5–92 551.586:616.988.23(71)

Caron, Jean, **La poliomyélite à Montréal de 1913 à 1959.** [Poliomyelitis in Montreal from 1913 to 1959.] *Bulletin de Géophysique,* Montreal, No. 8:12–24, Oct. **1960.** 4 tables, 4 refs. English summary p. 12. **DWB, DLC**—The author gives an historical description of all the epidemics of poliomyelitis which struck the City of Montreal. All available documents have been perused and statistical tables have been compiled. The full collaboration generously given by the local Public Health Service is gratefully acknowledged. *Subject Headings:* **1. Weather effects on poliomyelitis 2. Montreal, Canada.**—*Author's abstract.*

12.5–93 551.586:574

Vering, F. (*Austria*), **Die biologische Reaktion in Zeitpunkt und im Zeitablauf.** [Immediate and prolonged biological reaction.] *International Journal of Bioclimatology and Biometeorology,* Leiden, Vol. 1, (Pt. 4, Human Bioclimatology), **1957.** 3 p. **DWB**—The biological activity of a bacteria population *Staphylococcus pyogenes aureus* was investigated by continuously recording curves of population growth and decline with a nephelograph. Studies on the biological activity of atmospheric bacteria indicated that some have a purifying effect and that atmospheric humidity plays a role in the toxic effect of atmospheric impurities. *Subject Heading:* **1. Biological activity of bacteria.**—*I.L.D.*

12.5–94 551.586:61

Marinov, V., **Sŭvremenno sŭstoianie na mediko-meteorologichnoto prouchvane i nasoki na razvitie u nas.** [Present state of research in medical meteorology and lines of its development in Bulgaria.] *Khidrologiia i Meteorologiia,* Sofia, No. 2: 49–57, **1958.** 3 figs., 2 tables, 10 refs. Russian and English summaries p. 56–57. **DLC**—The author examines the present state of research in medical meteorology. Methods used in medical meteorology are reviewed and some of the results obtained are given. The author believes that the following more important problems could be investigated in Bulgaria: 1) the connection between weather and certain diseases, 2) the nature of biotropic factors, 3) clinical-laboratory investigations of weather effects, 4) climatology and meteorology of health resorts and 5) medical meteorological forecasting. *Subject Headings:* **1. Medical meteorology 2. Bulgaria.**—*Author's abstract.*

B8. RADIOACTIVITY

See also: **NASA reactor facility hazards summary,** 12.5–399; **Obs. of ionization and natural radioactive dust, Tokyo** (Kawano, Nakatani), 12.5–410.

B9. MILITARY METEOROLOGY

See also: **Weather services provided by the Atmos. Studies Branch,** 12.5–39.

12.5–95 551.501.1:551.508.824:355

Goettelman, R. C.; Ludwig, F. L.; Poppoff, I. G. et al., **Study of weather stations for Army use, Phase 3, Design guide.** Stanford Research Institute, Menlo Park, Calif., Contract DA-36-030-Sc78154, Summary Report, Nov. 30, **1959.** 236 p. 57 figs., 19 tables, 14 refs.

DWB (M(051) S785st)—A guide has been prepared for the design of two general types of automatic weather stations for Army use. These are: 1) small, portable (by one or two men) stations capable of sensing and telemetering basic weather parameters, and capable of unattended operation for one or two weeks; and 2) large, research-type stations, capable of sensing and telemetering many weather parameters of meteorological interest, and capable of unattended operation for periods from three months to one year. Components are suggested which should be capable of reliable operation under many climatic environments and which should provide reasonable accurate and representative data. Selections were made based on the following criteria: 1) commercial availability or straight-forward development requirements; 2) long-term reliability and 3) low power requirement. Over-all station configuration is discussed and schematic and block diagrams are presented to illustrate suggested solutions. Power source recommendations are made. The necessity to consider both environment and logistics in choosing power sources for particular situations is discussed. Power, weight, and volume estimates are made for both types of stations. *Subject Headings:* **1. Automatic weather stations 2. Military meteorology. I. Reiche, L. P.**—*Authors' abstract.*

12.5–96 551.551.5:551.557:629.13:623.451

§*†Williams, N. R., **General features of Northern Hemisphere winds aloft and their variations, with application to aircraft- and missile-system analysis.** *U. S. Naval Air Missile Test Center, Point Mugu, Calif., NAMTC Memorandum Report*, No. LE-5-58, Aug. 15, **1958.** 54 p. 8 figs., 10 tables, 41 refs., 15 eqs. Bibliog., p. 38. Mimeo. **DWB** (M(055) U5842un)—A valuable cross section of the current knowledge of the subject is given in this analytical work. Characteristic features of winds aloft up to 100,000 ft are described. It is shown that wind force and speed in the jet stream of about the order of 100 knots is typical, 200 250 knots are encountered rarely. The clear air turbulence in the jet stream and the effect of turbulence on high altitude flights and missiles are discussed. Tabular and graphical presentation of results along with mapped synoptic situations are provided for easy reference throughout the text. The hydrostatic equation with variable gravity and its application to the computation of the Air Research Development Command Model Atmosphere 1956, as well as the use of the geostrophic wind equation, are appended. *Subject Headings.* **1. Upper air wind variations 2. Clear air turbulence 3. Turbulence effects on high altitude flights 4. Turbulence effects on missiles.**—*W.N.*

12.5–97 551.593:535:623.451(08)

Society of Motion Picture and Television Engineers, N. Y., **Symposium on optical instrumentation for missile testing.** *Its Journal*, 67(4):225–255, April **1958.** figs., photos, tables, refs., eqs. **DLC**—A symposium on optical problems of missile tracking and photography was held on May 2 and 3, 1957 during the Society's convention in Washington, D. C. The nine papers presented at the symposium and the discussions are given in full. The first three papers deal with atmospheric optics as affecting detection and recording of distant objects (these papers are being abstracted separately). The other papers cover technical problems of optical tracking and recording equipment. *Subject Headings:* **1. Missile tracking symposia 2. Missile photography 3. Atmospheric optics.**—*G.T.*

12.5–98 551.510.3:551.510.53:623.451

*Sissenwine, Norman; Ripley, William S. and Cole, Allen E., **Behavior of atmospheric density profiles.** *U. S. Air Force. Cambridge Research Center, Air Force Surveys in Geophysics*, No. 109, Dec. **1958.** 84 p. numerous figs., numerous tables, 15 refs., 3 eqs. **DLC**—A statistical method of estimating the variation in range of free-falling bombs or missiles due to atmospheric density variations is presented. Arrays of means and standard deviations of density by 2-km intervals of altitude up to 28 km and coefficients of correlations between levels are provided for the required calculations. An example of determination of the density contribution to the "Circular Error Probable" (the variability in range exceeded 50 percent of the time) is provided. Graphs are also presented which indicate some atmospheric density relationships of interest to the meteorologist as well as to the designer. *Subject Headings:* **1. Upper atmosphere density variations 2. Air density effects on falling missiles.**—*Authors' abstract.*

C. ASTRONOMY AND ASTROPHYSICS

C1. GENERAL

See: **Vistas in astron.** (Beer, *ed.*), 12.5–1; **Investigations with stellar pyranometers** (Dirmhirn), 12.5–208.

C2. SUN

See also: **Increase in cosmic ray intensity during solar flare of Feb. 23, 1956** (Eckhartt), 12.5–122; **Cosmic intensity variations during two solar cycles** (Forbush), 12.5–123; **27-day variation in cosmic ray intensity and in geomag. activity** (Forbush), 12.5–124; **Interaction of solar plasma and geomag. field** (Warwick), 12.5–138; **Geomag. activity following large solar flares** (Warwick), 12.5–139; **Green coronal line intensity and geomag.** (Warwick), 12.5–140; **Flocculi and 27-day recurrence tendency in magnetic disturbances** (Mustel', Mitropol'skaia), 12.5–141; **Similarity between singularity and climat. variation** (Nagao), 12.5–378.

12.5–99 523.72

*†Aller, L. H. and Chapman, Sydney (*both, Univ. Michigan*), **Diffusion in the sun.** *Astrophysical Journal*, Chicago, 132(2):461–472, Sept. **1960.** 10 tables, 27 refs., 11 eqs. **DWB DLC**—The gradients of pressure and temperature in the sun set up an electrostatic field that maintains electrical neutrality to a high degree of approximation. The gradients and the field cause the heavier ions to diffuse downward. The rate of this diffusion is estimated for different depths, on the basis of a model (III) obtained by Weymann. The diffusive drainage of the heavier elements from the convection zone reduces their abundances relative to hydrogen in the sun's atmosphere. It also affects their relative abundances among themselves. The reduction is naturally greater, the shallower the convection region. The low abundance of lithium in the sun's atmosphere is taken to indicate that the convective region extends to a depth at which its destruction by nuclear reactions can occur-namely, down to three-tenths of the solar radius. For this depth the reduction of the abundance of the heavier elements brought about by diffusion during 4.5×10^9 years is about 10 percent for silicon, 12 percent for iron, and about 25 percent for lead. The diffusion will modify the concentration of these elements in the region below, but only by a small percentage. *Subject Headings:* **1. Diffusion processes 2. Solar atmosphere.**—*Authors' abstract.* Ⓢ

12.5–100 523.74

Waldmeier, M. (*Zurich*), **Die Sonnenaktivität im Jahre 1957, . . . 1958.** [Sun activity in 1957, . . . 1958.] *Naturforschende Gesellschaft in Zürich, Vierteljahrsschrift*, 103(4):185–212, **1958.** 3 figs., 13 tables, eqs. English summary p. 185; 104(3):345–378, **1959.** Reprint issued as *Zürich. Eidgenössische Technischehochschule, Sternwarte, Astronomische Mitteilungen*, No. 215 [**1958**]; No. 221, **1959. DLC**—The present paper gives the frequency numbers of sunspots, photospheric faculae, flares and prominences as well as the intensity of the coronal line 5303 A and of the solar radio emission at the wavelength of 10.7 cm, all characterizing the solar activity in the year 1957. *Subject Headings:* **1. Solar activity 2. Sunspots.**—*Author's abstract.*

12.5–101 523.752

Waldmeier, M. (*Zurich*), **Bewegungen in Sonnenprotuberanzen.** [Motion in sun protuberances.] *Zeitschrift für Astrophysik*, Berlin, 44:213–220, **1958.** 3 figs., table, 7 refs. English summary, p. 213. Reprint issued as *Zürich. Eidgenössische Technischehochschule, Sternwarte, Astronomische Mitteilungen*, No. 212, [**1958**]. **DLC**—The motions of a quasi-eruptive prominence in the polar region have been investigated. Some of the knots are receeding from the sun, others are falling down to the chromosphere. The maximum height is about 400,000 km, the largest velocity 380 km/s. The accelerations deduced from the velocities are due to the sun's gravitation and to a unknown "prominence force." The latter is directed upwards in the higher regions of the trajectories and seems to have a center around the region A (figure 3) situated outside of the prominence at a height of about 60,000 km. The downward

motions are governed by forces in the opposite direction of the motion or by attractions from the center A. The accelerations from the "prominence-force" are of the same order of magnitude as the gravitational accelerations. *Subject Heading:* **1. Solar prominences.**—*Author's abstract.*

12.5–102 523.753:551.594.6:550.385

Waldmeier, M. (*Eidgenössische Sternwarte, Zurich*), **Sonnen-Eruption im integralen Light.** [Solar eruption in whole light.] *Die Naturwissenschaften*, Berlin, 45(10):236–237, May 15, **1958. DLC**—The solar eruptions observed and photographed (for the first time) in white light was observed on March 23, 1958, at the Eidgenössische Observatory in Zurich, at the Astrophysical Observatory in Arosa, and at the Astronomical Observatory in Locarno. It began 9^h05 WZ, reached maximum brightness at 10^h05 and disappeared in white light in Zurich at 10^h55. The eruption had the heliographic coordinates $b=-13°$, $l=92°$ and occurred on the eastern margin of a sunspot. It was near the E-margin of the sun, a distance $d=730$ from the central meridian, so that its projected distance from the solar margin was 34,000 km. The corona showed not the slightest change in intensity or structure above this eruption. Nothing indicated a streaming away of matter. Intense brightness and structural changes appeared in the corona when the eruption rose spot-like beyond the solar margin. As a result of UV emission from the eruptions various terrestrial effects appeared between 10:00 and 12:00 o'clock, namely Mögel-Dellinger effect, increase of atmospheric parasites by 100% and terrestrial magnetic disturbances. *Subject Headings:* **1. Solar eruption observations 2. Solar eruption in white light 3. Terrestrial effects.**—*I.L.D.*

12.5–103 523.75:551.510.535

†Ellison, M. A., **The observation of solar flares.** *International Council of Scientific Union, Brussels, Ninth report of the Commission for the Study of Solar and Terrestrial Relationships.* Pub. Paris, **1957.** p. 15–25. 3 figs., 2 tables, 42 refs., photo. **DWB**—The period under review covers the rapid rise from minimum to maximum solar activity. Chromospheric and coronal activity reached an unprecedentedly low level at the minimum (1954.4), a feature which was also reflected in the remarkable regularity of the "undisturbed" corona, with its two equatorial rays, as observed at the eclipse of June 30, 1954. During the following year the relative sunspot number (R) and associated flare activity rose normally, but in the latter-half of 1955 and throughout 1956 the rise of activity was unusually steep: the first major peak of the sunspot maximum was reached in 1956 Nov. ($R=202.7$), only 2.5 years after the minimum. The first three months of 1956 were notable for the appearance of large magnetically complex spot groups, mainly in the northern hemisphere. These groups gave rise to a high level of flare activity associated with sudden ionospheric disturbances. This activity culminated in the occurrence of the 3^+ flare of flare of Feb. 23, 1956 which must be regarded from all points of view as the most outstanding flare event of the whole period. Its development and terrestrial effects are briefly summarized. *Subject Headings:* **1. Solar flares 2. Ionospheric disturbances 3. Solar-ionospheric relationships.**—*A. Assur.*

12.5–104 523.755:535.33

Waldmeier, M. (*Zurich*), **Die Form der Korona nach Beobachtungen in der Linie 6374 Å.** [The shape of the corona following observations in the 6374 Å line.] *Zeitschrift für Astrophysik*, Berlin, 45:155–170, **1958.** 2 figs., 5 tables, 12 refs., 3 eqs. English summary p. 155. **DLC.** Reprint issued as *Zürich. Eidgenössische Technischehochschule, Sternwarte, Astronomische Mitteilungen*, No. 214, [**1958**]. **DLC**—The height of the monochromatic corona, observed in the light of the red line 6374 Å has been measured at all heliographic latitudes on 47 days distributed over the years 1941–1957. The height of the red corona amounts to about 0.6′ at the poles and increases toward lower latitudes where it reaches a maximum of about 2.0′. Occasionally over active regions extensions of the red corona as high as 4.7′ have been observed. At heliographic latitudes $b>35°$ the height of the red corona shows almost no variation from sunspot-minimum to maximum. As the latitude increases the height is decreasing. During periods of low solar activity the minimum height is found near $b=65°$, whereas during periods of high activity it is found at the poles. The maximum height of the red corona occurs over

the zones of spots and faculae, except during sunspot-minimum when it is observed over th equator. The height of the red corona and its variations with the solar cycle can be accounte for in terms of variations of electron density and temperature if one takes into account excitatio by electron collisions as well as by radiation. *Subject Headings:* **1. Solar corona heigh 2. Coronal red line.**—*Author's abstract.*

12.5–105 523.755 523.7

Waldmeier, M. (*Zurich*), **Die Komponenten des kontinuierlichen Koronaspektrums** [The components of the continuous corona spectrum.] *Zeitschrift für Astrophysik*, Berlin 46:17–25, **1958.** 2 figs., 4 tables, 13 refs., 6 eqs. English summary p. 17. Reprint issued a *Zürich. Eidgenössische Technischehochschule, Sternwarte, Astronomische Mitteilungen*, No. 21 [**1959**]. **DLC**—Hitherto there has always been found a discrepancy in the determination c the contributions of the K- and F-components to the total coronal light, according to whethe these components have been deduced from spectroscopic or from polarimetric measurements It is shown that by the spectroscopic method the intensity of the K-component comes out to small because the large Doppler shift reduces the intensity of the continuum of the K-compo nent by broadening the Fraunhofer lines. Allowing for this effect the contribution of th K-component becomes larger and comes in agreement with the results from Polarimetri measurements. In addition the peculiar energy-distribution of the coronal spectrum has beer explained by the same effect. Finally for the F-component a slight weakening from the equato to the poles has been derived from the polarimetric measurements. *Subject Headings* **1. Coronal emission intensities 2. Continuous corona spectrum.**—*Author's abstract.*

12.5–106 523.77 551.521.6

Thomas, Richard N. (*Harvard College Obs., Mass.*), **Features of the solar spectrum a imposed by the physics of the sun.** (In: Conference on the Use of Solar Energy, Univ. o Arizona, 1955, **Transactions,** pub. **1958.** Vol. 1:1–16, 2 figs., 16 refs., 4 eqs.) **DWB**—A discussion of the general features of, and the conditions in, the outer solar atmosphere, ha been given. Photon and corpuscular components of solar energy spectrum have been studie in association with solar events. A new idea is developed on the relative meteorological effect of photon and corpuscular components. This report contains investigation of the effect o solar corpuscular emission on small bodies of solar system. (For abstract from another source *see* 9.11–202, Nov. 1958, *Met. Abs.*) *Subject Headings:* **1. Solar spectrum 2. Solar atmosphere** —*N.N.*

C3. ECLIPSES

12.5–107 523.75:523.78(624

Zirker, J. B. (*Sacramento Peak Obs., New Mexico*), **The metallic chromosphere at th Khartoum eclipse.** *Astrophysical Journal*, Chicago, 127(3):680–713, May **1958.** 8 figs. 8 tables, 20 refs., 10 eqs. **DWB, DLC**—Logarithmic emission gradients and absolute integrate emission as functions of height are presented for moderately strong metal lines observed at th Khartoum eclipse by the High Altitude Observatory expedition. The gradients are controlle by the combined action of self-absorption and the chromospheric density gradient. Self absorption is evaluated for a number of metal lines, from which follows an estimate of th density distribution through the low chromosphere. The cores of many metallic Fraunhofe lines appear to originate in the chromosphere. *Subject Headings:* **1. Chromosphere 2. Sola eclipse, Feb. 1952 3. Khartoum, Sudan.**—*Author's abstract.*

12.5–108 523.78 523.755:535.24

Waldmeier, M. (*Zurich*), **Ergebnisse der Zürcher Sonnenfinsternisexpedition 1954.** [Results of the 1954 Zurich solar eclipse expedition.] *Zeitschrift für Astrophysik*, Berlin, 43:289–307, **1957.** 6 figs. (incl. photos), 7 tables, 11 refs., eqs. English summary p. 289. Reprint issued as *Zurich. Eidgenössische Technischehochschule, Sternwarte, Astronomische Mitteilungen* No. 210, [**1957**]. **DLC**—The photometry of the corona was carried out in the interval $r = 1.2$—2.0 using plates obtained by the camera of 8 m focal distance. The calibration is given in absolute units. The isophotes are strongly elongated. The ratio of the intensities

at the equator and at the pole amounts to 3.4 at its maximum, a value far in excess of all coronas hitherto observed. The smallest intensities do not occur at the poles but at $b=65°$. The equatorial distribution of the brightness is in close agreement with VAN DE HULST's model, but the polar intensities predicted by the model are 44% larger than the observed ones. *Subject Headings:* **1. Solar eclipses 2. Corona photometry.**—*Author's abstract.*

C4. MOON AND PLANETS

See also: **Photometry of Mars** (Barabashov, Koval'), 12.5–13.

12.5–109 551.507.362.1:623.454.8:523.3

Ehricke, Krafft A. and Gamow, George, **A rocket around the moon.** *Scientific American*, N. Y., 196(6):47–53, June **1957.** 7 figs. **DWB, DLC**—It is predicted that the moon will be reached within 5 years. Orbits and techniques of launching the moon vehicle are described. Equipment and the safe return to earth thereof is also considered. This popular article is fully illustrated by diagrams showing possible orbits. One possible experiment would be to drop a small atomic bomb on the moon and collect some of the dust kicked up by the explosion to bring back to earth. *Subject Headings:* **1. Moon rockets 2. Atomic bomb on moon.**—*M.R.*

12.5–110 523.164.352:621.396

Radiostrahlung von der Venus. [Radio emission from Venus.] *Die Umschau*, Frankfurt a.M., No. 1:11, **1958.** 5 refs. **DWB, DLC**—Two types of radio radiation were received from Venus, 1) a weak steady radiation at 3.15 cm. (NRL, Washington) and 2) brief bursts at 11m (Ohio State Univ., Columbus). The former could be interpreted in terms of heat radiation, indicating a temperature of 80°C on Venus. The latter may be attributed to thunderstorm phenomena on Venus. However, both of these interpretations are merely speculative until further data can be obtained. *Subject Heading:* **1. Radio emission from Venus.**—*G.T.*

C5. COMETS AND METEORS

12.5–111 523.5/6:08(493.6)

Szasz, G. J. and Singer, S. Fred, **Symposium on the Physics of Comets and Meteors.** *U. S. Office of Naval Research, London, Technical Report*, ONRL-129-52, Nov. 18, **1952.** 8 p. eqs. **DWB**—The Symposium on the Physics of Comets and Meteors, held at the University of Liège, was divided into many sections. Some papers read by Czechoslovak scientists gave statistics on comets which have been discovered. Two papers dealt with theoretical contributions to the problem of vibrational transition probabilities of molecular bands. Two communications were presented on the structure of comet heads and tails. There was a discussion of LYTTLETON's theory of comet formation. *Subject Headings:* **1. Meteor physics symposia 2. Comets 3. Liège, Belgium.**—*A.H.K.*

12.5–112 523.6

Brahde, Rolf and Brekke, Kjell, **On the secondary tail of comet Arend-Roland 1956 h.** *Astrophysica Norvegica*, Oslo, 6(3), Nov. **1957.** 7 p. 2 figs. (incl. photo), 2 eqs. **DLC**—124 binocular observations of the comet Arend-Roland 1956 h, at Oslo and Harestua on April 22–25, 1956, by members of the Astrophysical Institute showed that 2 tails form at an angle corresponding to hands of a clock at 5 o'clock or 7 o'clock. The secondary tail is pointed in the direction of the sun. It is deduced that a comet scatters its dust in the plane of its orbit thus forming the secondary tail. *Subject Headings:* **1. Comet antitails 2. Arend-Roland Comet.** —*M.R.*

12.5–113 551.501.81:551.590.25:535.31

Weiss, A. A. (*Dept. of Physics, Univ. of Adelaide*), **The temporal variation of the heights of reflection points of meteor trails.** *Australian Journal of Physics*, Melbourne, 12(2):116–126, June **1959.** 7 figs., 4 tables, 8 refs., 2 eqs. **DLC**—Heights of reflection points of over 6000 sporadic meteors measured with a 27 Mc/s combined C.W.-radar equipment are analyzed. There is no significant seasonal variation in either the mean height or the width of the height

distribution. The mean height alone shows a diurnal variation with maximum height near midnight. A regrouping of the data reveals a dependence of both height parameters on the zenith angle of the apex of the Earth's way, with a large scatter. The observations are compared with height distributions computed for a uniform heliocentric distribution of sporadic meteors with uniform heliocentric velocities. Observed and predicted r.m.s. deviations are in agreement. The model reproduces correctly the form of the observed dependence of mean height on the zenith angle of the apex, for zenith angle angles less than 100°, but the extent of the predicted variation of mean height (12–20 km, depending on the assumptions) far exceeds the observed 3 km. This discrepancy may be reduced considerably by adding to the uniform model distribution a large component of sporadic meteors moving with low speeds in direct orbits whose inclination to the plane of the ecliptic is small. *Subject Headings.* **1. Radar observation of meteor trails 2. Meteor trail reflection points 3. Meteor height variations.**—*Author's abstract.* Ⓢ

C6. RADIOASTRONOMY

12.5–114 523.164.32 551.521.67:621.396.8

Maltby, Per, **Preliminary report on positional fluctuations of solar radio sources on 200 Mc/s.** *Astrophysica Norvegica*, Oslo, 6(7):75–84, Dec. **1958.** 3 figs., 8 refs., eq. **DWB**—Fluctuations in the apparent position of solar radio sources on 200 Mc/s have been studied using observations obtained with the phase-switched interferometer at the Solar Observatory, Harestua, near Oslo. Observations were performed from February to September 1958. Results: 1) The analysis indicates that the magnitude of the positional fluctuations depends on whether the solar radio source is closely connected with a magnetic field in the active region or not. 2) No increase in the magnitude of the fluctuations in position as the source moved towards the solar limb is found on 200 Mc/s. Possible interpretations of the observational results are discussed. *Subject Heading:* **1. Solar radio source locations.**—*Author's abstract.*

12.5–115 551.521.67:523.164.82:523.75

Neylan, A. A. (*Mt. Stromlo Obs., Canberra*), **An association between solar radio bursts at metre and centimetre wavelengths.** *Australian Journal of Physics*, Melbourne, 12(4):399–403, Dec. **1959.** 4 figs., 7 refs. **DLC**—From a study of simultaneous meter and centimeter solar radio bursts, it appears that the type III events which coincide with centimeter bursts are frequently followed by a particular form of broad-band emission. This last burst, termed type V, is observed mainly below 150 Mc/s on radio spectrum records where it resembles a bright glow lasting for about 1 min. Synchrotron radiation has been suggested as the mechanism for type V bursts. The accompanied centimeter burst lasts a length of time comparable with that of the meter bursts, is indistinguishable in intensity from unaccompanied centimeter bursts, and on present evidence, may be due to either thermal or synchrotron radiation. A stream of highly energetic particles ejected from a flare region on the Sun is suggested as the cause of both events, exciting centimeter bursts in or near the chromosphere and type V bursts at large heights in the corona. *Subject Headings:* **1. Solar radio emissions 2. Emission spectra.**—*Author's abstract.*

12.5–116 551.510.536 551.594.6

De Feiter, L. D., **De exosfeer: atmosferische fluittoontjes en radiostraling uit de aardse korona.** [The exosphere: atmospheric whistlers and radio radiation from earth's corona.] *Hemel en Dampkring*, The Hague, 58(7/8):161–181, July/Aug. **1960.** 10 figs. **DWB, DLC**—Radio waves follow remarkable paths when they cross the earth's atmosphere; they move from one hemisphere to the other. Related to atmospheric whistlers are the very low frequency emissions in the earth's atmosphere caused by magnetic storms and polar light. The study of the two phenomena has been of great interest in the research on the exosphere. The author gives a historical account of whistlers, observed for the first time in 1888 in Austria, and also describes the instrumentation, especially the antenna. Storey differentiated between short and long whistlers and the article explains this difference. Whistler phenomenon and nose whistlers are explained theoretically; the relation between whistlers and the outer parts of the atmosphere is shown. One chapter gives a very good description of the exosphere and

of rising whistlers, odd shaped whistlers, hooks, etc. The article ends by giving some consideration to the observations made in this field. *Subject Headings:* **1. Exosphere 2. Whistler analysis 3. Radio radiation.**—*A. V.* ⑤

D. OUTER ATMOSPHERE

D1. COSMIC RADIATION

See also: **Magnetic storm effects** (Pikelner), 12.5–136.

12.5–117 551.521.64

Ginzburg, V. L. and Fradkin, M. I., **Proiskhozhdenie kosmicheskikh luchei.** [The origin of cosmic rays.] *Priroda*, Moscow, No. 8:3–12, Aug. **1958.** 3 figs., 2 tables, foot-refs., eqs. **DLC**—A semipopular account of the contemporary theory of the origin of primary cosmic rays and of the experimental data upon which it is based. The discussion includes the following: the energy spectra, nuclear components and relative content of the nuclear components of primary cosmic rays, the characteristics of cosmic radio radiation of galactic origin, including the thermal radiation of interplanetary gases and the nonthermal constituents, the mechanism of magnetically accelerated radiation, the energy spectrum of electrons as determined from the galactic radio radiation, the movement of cosmic ray particles in the galactic system and the statistical mechanism of the acceleration of particles. The assumption that cosmic rays are generated as a result of the flare up of supernovae and new stars is adequate for explaining known facts. *Subject Heading:* **1. Cosmic ray origin.**—*I.L.D.*

12.5–118 551.507.362.2:551.521.64

Kurnosova, L. V., **Nekotorye rezul'taty issledovanii pri pomoshchi iskusstvennykh sputnikov Zemli.** [Some results of investigation with the 3rd artificial earth satellite.] *Priroda*, Moscow, No. 6:85–86, June **1958.** Fig. **DLC.** Trans. into English by E. R. Hope issued as *Canada. Defence Research Board, Translation* T-304-R, Sept. **1958.** 2 p. typescript. **DWB**—Satellite data on the intensity of cosmic radiation showed that up to 700 km the intensity increased up to 40% in comparison with that observed at 200 km. The intensity above 200 km increases because of two reasons, namely: with increasing height the "screening" action of the earth decreases, and since cosmic rays are propagated in space isotropically a recording device in space records considerably more than one near the earth; also the higher the elevation the more particles can penetrate the magnetic field of the earth, which exerts a deflecting action upon cosmic particles and this effect is more intense the closer they are to the earth. The line of equal intensity of cosmic rays does not coincide with the geomagnetic parallels. During the flight of the earth satellite the halogen counters recorded short period, abrupt variations in the intensity of the cosmic rays, while such variations were not observed at the surface of the earth. *Subject Headings:* **1. Satellite cosmic ray observation techniques 2. Cosmic ray intensity variations.**—*I.L.D.*

12.5–119 551.507.362.2:551.521.64

Miyazaki, Yukio and Takeuchi, Hajime (*Inst. of Physical and Chemical Research, Tokyo*), **Altitude dependence and time variation of the radiation intensity observed by U. S. Satellite 1958α.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 12(4):448–458, **1958.** 6 figs., table, 6 refs. **DWB, DLC**—Telemetering signals from the U. S. Satellite 1958α passing near Japan were analyzed (cosmic rays). The results are as follows: 1) As the altitude increased from 340 km to 1200 km, the counting rate of a single G-M counter mounted in the satellite showed a gradual rise and above 1200 km a steep rise. The altitude curve also showed appreciable day-to-day variation which masked the latitude dependence of the intensity between 12° to 24° geomagnetic latitude. 2) The altitude curve seemed to show a comparatively wide hump at about 350 to 800 km. 3) Dividing the data into a certain narrow range of latitude and altitude, the counting rate increased gradually day by day from Feb. 1 to Feb. 10, 1958. Finally, it reached a value factor 2 greater than the earlier one. While in this period, the planetary magnetic index Kp was also increasing but its fine variation did not always correspond to that of the counting rate. The variation of

the radiation intensity at higher altitude seemed to have an appreciably longer time constant than that of the geomagnetic fluctuation. 4) On Feb. 11, the enhancement of the radiation intensity was observed at an altitude of about 1000 km. The time of onset was inferred to be between 0640 and 0842 UT. The neutron intensity of cosmic rays observed at sea level or at mountain altitude showed an increase in the neighborhood of 0700 UT. *Subject Headings:* **1. U. S. Satellite 1958 Alpha (Explorer I) 2. Cosmic ray variations at high altitudes 3. Satellite cosmic ray observation.**—*Authors' abstract.*

12.5–120 551.508.95:551.507.362.2:551.521.64

Rosen, Alan; Sonett, Charles P.; Coleman, Paul J., Jr. (*all, Space Tech. Lab., Los Angeles 45, Calif.*) and McIlwain, Carl E. (*State Univ. Ia., Ia. City*), **Ionizing radiation at altitudes of 3,500 to 36,000 kilometers, Pioneer I.** *Journal of Geophysical Research*, Wash., D. C., 64(7): 709–712, July **1959.** 3 figs., 2 refs. **DLC**—The total ionizing component of cosmic radiation was measured on Oct. 11, 1958 by means of an ionization chamber mounted on the Pioneer I lunar probe vehicle. Data were taken over an altitude range of 3500 to 36,000 km and a latitude range of 35°N and 5°N. The calibration procedure and the analysis of the telemetered data are described. *Subject Headings:* **1. Cosmic radiation 2. U. S. space probe Pioneer I.**—*Authors' abstract.* Ⓢ

12.5–121 551.521.64

*†Yagoda, Herman, **Observations on heavy primary cosmic ray nuclei above the atmosphere.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 60, July **1958.** 33 p. 13 figs. (incl. photos), 9 tables, 29 refs., 8 eqs. **DLC**—The flux of heavy primaries of $Z \geq 6$ has been evaluated from small emulsion blocks flown on Aerobee rockets specially designed to keep condensed matter below 0.2 g cm^{-2} after penetrating the atmosphere. Parachute recoveries were effected from a day and a night flight, yielding $J^{\circ}_S = 4.85 \pm 0.95$ and 5.05 ± 0.88 (m^2 sec sterad)$^{-1}$, respectively, suggesting the absence of a pronounced day-night effect in the total heavy primary flux. The average for the two Aerobee flights is $J^{\circ}_S = 4.98 \pm 0.65$ and M°/H° = ratio is 1.91 ± 0.55. This is in good agreement with a Viking rocket flight made in 1954 for which $J^{\circ}_S = 5.38 \pm 0.58$ and $M^{\circ}/H^{\circ} = 2.01 \pm 0.50$ when the omnidirectional fluxes are averaged over the entire zenith angle spread accepted by the emulsions along the rocket trajectories. Balloon observations from the same geomagnetic locality (41°N) yield a vertical flux about 1.61 times greater than the rocket observations, in good agreement with geomagnetic theory which predicts small fluxes at zenith angles greater than 45°. Based on the interactions of L and S-nuclei and their mean free paths in emulsion, the L°/M° ratio is estimated to be 0.26 ± 0.09 which favors a smaller flux of Li-Be-B nuclei at the top of the atmosphere than in most extrapolations of balloon observations. A study of the mode of fragmentation of the heavy primaries suggests that secondary L-nuclei are produced more frequently at rocket elevations than in balloon exposures. This altitude variation may be associated with the anomalous cascades observed on the Viking 10 flight. In this flight secondary L-nuclei originating in the fragmentation of primary S-nuclei, appear to have collision cross sections greater than geometric. To confirm this, it is proposed that a 12-lb emulsion block be exposed in an Aerobee-Hi. *Subject Headings:* **1. Cosmic ray nucleon distribution 2. Primary cosmic rays.**—*Author's abstract.*

12.5–122 551.521.64:523.75

Eckhartt, Dieter, **On the increase in cosmic ray intensity and the electromagnetic state in interplanetary space during the solar flare of Feb. 23, 1956.** *Tellus*, Stockholm, 10(1):126–136, Feb. **1958.** 4 figs., 28 refs. **DWB, DLC**—The solar flare increase of cosmic ray intensity observed at various ionization chamber stations has been studied. The orbits of the flare cosmic ray particles have been corrected for their deflection in the geomagnetic field. A detailed discussion of the different onset times of the solar flare increase registered at these stations is given. These differences in onset times serve as a means to study the electromagnetic state in interplanetary space during the cosmic ray outburst. Special attention is paid to those stations which observed the earliest onset times. For one of those, Hobart, it can definitely be shown that cosmic ray particles of momenta up to around 40 GeV/c did not arrive

from the direction of the sun. The station did not lie inside one of Firor's impact zones at the beginning of the solar flare. This shows the existence of deflecting magnetic fields between the sun and the earth. It appears from this investigation that the cosmic ray particles which caused the earliest onset times had come from directions towards a solar beam which—according to Alfvén's beam model—would be expected to produce the large magnetic storm observed two days after the flare. A probable mechanism of trapping and guiding the flare low energy cosmic ray particles of such a beam is also discussed. *Subject Headings:* **1. Cosmic ray intensities 2. Solar effects on cosmic rays.**—*Author's abstract.*

12.5–123 551.521.64 523.74

Forbush, Scott E. (*Dept. Terrestrial Magnetism, Carnegie Inst. of Wash., Wash., D. C.*), **Cosmic-ray intensity variations during two solar cycles.** *Journal of Geophysical Research,* Wash., D. C., 63(4, Pt. 1):651–669, Dec. **1958.** 14 figs., 4 tables, 10 refs. **DWB, DLC**—Data for the 12 month waves in cosmic ray intensity and the height of the 100 mb layer at Godhavn, Greenland, at Cheltenham, Md. and Christchurch, New Zealand (and at nearby radiosonde stations) are shown on a graph and in a table. The 12 month wave at Huancayo, Peru is shown on a harmonic dial for the years from 1937–1956, and for the same after deducting deviations from average 12 month wave for Cheltenham. Corrections for drift for Huancayo (1937–1957) are based on Cheltenham data which showed no drift. Christchurch data were also corrected for drift but appeared to be incorrect and the barometric or voltmeter corrections will be redetermined and the results published later. *Subject Headings:* **1. Cosmic ray intensity variations 2. Solar cycle-cosmic ray intensity relationships 3. Cosmic ray—100 mb height relationships 4. Cheltenham, Md. 5. Godhavn, Greenland 6. Christchurch, N. Z.**—*M.R.*

12.5–124 551.521.64:550.385.22:523.74

Forbush, Scott E. (*Dept. Terrestrial Mag., Carnegie Inst.*), **The 27-day variation in cosmic ray intensity and in geomagnetic activity.** (In: Lehnert, Bo Peter (*ed.*), **Electromagnetic phenomena in cosmical physics.** Cambridge, Univ. Press, **1958.** p. 332–344. 6 figs., 2 tables, 8 refs.) **DLC** (QB461.L43)—The amplitude of the average 27-day wave in cosmic ray intensity, at Huancayo, Peru, and its phase relative to that for the 27-day wave in international magnetic character figure (ICF) is determined from results of harmonic analysis of data for each of 246 intervals (or solar rotations) of 27 days. From these data, the variability of which is essential for tests of statistical significance, the amplitude of the average 27-day wave in cosmic ray intensity and its phase relative to that in geomagnetic activity is determined for each of three groups of solar rotations selected according to the average of the amplitudes of the 27-day waves in magnetic activity. A fourth group contained only 27-day intervals in which large cosmic ray decreases occurred. Relative to that in magnetic activity, the phase of the 27-day wave in cosmic ray intensity is found for the averages, to be the same for the four groups. The maxima of the average cosmic ray waves occur about 1–5 days after the minima of the corresponding waves in ICF. In general, the amplitude of the average 27-day wave in cosmic ray intensity, in the co-ordinate system in which its phase is relative to that of the 27-day waves in ICF tends to be greater for the selected groups of rotations with larger average ICF amplitudes. For most years near sunspot minimum the amplitude of the 27-day cosmic ray wave does not differ significantly from zero. Bartels found for 27-day waves in ICF the effective number of statistically independent 27-day waves for N successive solar rotations to be $N/3$; the number found for cosmic ray intensity is $N/2$. Thus, on the average the 27-day recurrence tendency is less for cosmic ray intensity than for magnetic activity. *Subject Headings:* **1. Cosmic ray periodicities 2. Twenty-seven-day cosmic ray cycles 3. Geomagnetic effects on cosmic rays.**—*Author's abstract.*

12.5–125 551.521.64:523.165

†Ehmert, A. (*Max-Planck Inst. f. Stratos.-Phys.*) *Weissenau, Germany*), **Solar cosmic radiation and the interstellar magnetic field.** (In Lehnert, Bo Peter (*ed.*), **Electromagnetic phenomena in cosmical physics.** Cambridge Univ. Press, **1958.** p. 404–419. 10 figs., table, 24 refs., 16 eqs.) **DLC** (QB461.I43)—The increase of cosmic radiation on Feb. 23, 1956 by solar radiation exhibited in the first minutes a high peak at European stations that

were lying in direct impact zones for particles coming from a narrow angle near the sun, whilst other stations received no radiation for a further time of 10 minutes and more. An hour later all stations in intermediate and high latitudes recorded solar radiation in a distribution as would be expected if this radiation fell into the geomagnetic field in a fairly isotropic distribution. The intensity of the solar component decreased at this time at all stations according to the same hyperbolic law ($\sim t^{-2}$). It is shown, that this decreasing law, as well as the increase of the impact zones on the earth, can be understood as the consequence of an interstellar magnetic field in which the particles were running and bent after their ejection from the sun. Considering the bending in the earth's magnetic field, one can estimate the direction of this field from the times of the very beginning of the increase in Japan and at high latitudes. The lines of magnetic force come to the earth from a point with astronomical co-ordinates near 12.00, 30°N. This implies that within the low accuracy they have the direction of the galactic spiral arm in which we live. The field strength comes out to be about 0.7×10^{-6} gauss. There is a close agreement with the field, that FERMI and CHANDRASEKHAR have derived from HILTNER's measurements of the polarization of starlight and the strength of which they had estimated to the same order of magnitude. *Subject Headings:* **1. Solar cosmic ray propagation model 2. Cosmic ray distribution 3. Interstellar magnetic field effects on cosmic rays.**—*Author's abstract.*

12.5–126 551.521.64:550.385

Elliot, H. and Rothwell, P. (*both, Imperial Coll. Sci. Tech., London, Eng.*), **The solar daily variation of the cosmic ray intensity.** (In: Lehnert, Bo Peter (*ed.*), **Electromagnetic phenomena in cosmical physics.** *Cambridge Univ. Press*, **1958.** p. 392–403. 6 figs., 9 refs.) **DLC** (QB461.L43)—Some recent measurements of the solar daily variation for cosmic rays incident from the east and west direction at 45° to the vertical in London are described. The results do not agree with those to be expected if the variation was due to a nonisotropic flux of primary particles entering the earth's magnetic field. This result is discussed in relation to other evidence and it is concluded that the daily variation is probably due to a modulation of the primary cosmic ray intensity in the earth's magnetic field. *Subject Headings:* **1. Diurnal cosmic ray variations 2. Geomagnetic effects on cosmic rays.**—*Authors' abstract.*

12.5–127 551.521.64

Brennan, M. H.; Millar, D. D. and Wallace, C. S., **Air showers of size greater than 10^5 particles, Pt. 1, Core location and shower size determination.** *Nature*, London, 182(4640): 905–911, Oct. 4, **1958.** 5 figs., 2 tables, 7 refs., eqs. Also: Brennan, M. H.; Malos, J.; Millar, D. D. and Wallace, C. S., **Pt. 2, Čerenkov radiation accompanying the showers,** *Ibid.*, 182(4641):973–977, Oct. 11, **1958.** 3 figs., 3 tables, 10 refs. **DWB**—The first part of the investigation into properties of cosmic showers in the range from 105 particles to 107 particles, detectable in the lower atmosphere, commenced early in 1957 at the University of Sydney School of Physics. The block diagrammed detectors are described along with several other instruments used. Analysis of the data obtained show cores of the showers located with an accuracy of ±5 m at 90% probability level and size determination within +20% and −10% of this level. Scatter diagrams features observed number of particles vs. predicted ones, and the lateral structure function is graphed. Pt. 2 discussed the application of the light receiver operating only when no cloud was overhead. This happened in 206 showers of which 22 events were accompanied with light pulses as a function of shower size and core location which is also shown graphically and tabulated. Angular distribution of the Čerenkov light at least of 30° to the shower axis was established and in consequence angular distribution of the emitted photons. *Subject Headings:* **1. Cosmic ray showers 2. Čerenkov radiation 3. Australia.**—*W.N.*

12.5–128 551.521.64(572)

Sokolov, V. D. and Skripin, G. V., **V Iakutskoĭ laboratorii kosmicheskikh lucheĭ.** [In the Yakutsk Cosmic Ray Laboratory.] *Akademiia Nauk SSSR. Mezhduvedomstvennyĭ Komitet po Provedeniiu MGG (IGY), Informatsionnyi Biulleten'*, No. 5:40–42, **1958.** **DWB**—The cosmic ray laboratory of the Yakut branch of the Academy of Sciences of the U.S.S.R. is located on one of the most important areas in the world network of cosmic ray stations, namely along the 140° east longitude. The observatory carries out observations on cosmic rays within

a wide range of primary energies up to 10^{17} ev; in this range observations provide data for solving the problem of origin of cosmic rays and data on and the characteristics of interaction of high energy particles with matter. The observations are recorded with the aid of a neutron monitor, telescopic installations at different depths, ionizing chambers, stratospheric observations and observations on atmospheric showers. The equipment for stratospheric observations consists of a counter telescope with a solid angle of 1.41 ± 0.1 steradians for measuring intensity of cosmic radiation and a box for measuring temperature and pressure at altitude of flight. The study of the variation of intensity of cosmic rays at the earth and of temporal variations in the frequency of extensive atmospheric showers of cosmic rays and recording of the intensity of primary particles with a mean energy 3×10^{15} ev, etc. are discussed. Some of the observations obtained at this observatory at Tiksa during the IGY are summarized. *Subject Headings:* **1. Cosmic ray research station 2. Yakutsk, Yakut A.S.S.R.**—*I.L.D.*

D2. IONOSPHERE

See: **Transequatorial backscatter echoes** (Dueño), 12.5-70; **Obs. of solar flares** (Ellison), 12.5–103.

D3. AURORAS

See also: **Obs. of telluric currents and auroral arc** (Hessler), 12.5–29.

12.5–129 551.594.5(09)

Batcher, Ralph R. (*Douglaston, N. Y.*), **The cause of aurora borealis.** *Institute of Radio Engineers, N. Y., Proceedings*, 47(6):1154–1155, June **1959. DWB**—The author quotes a significant paragraph from Silliman's *American Journal of Science*, 59:450–53, May **1850,** indicating that an artificial aurora can be created in a vacuum tube (only newly discovered at that time) by introducing it into a magnetic field as per directions. This is said to be one of the earliest uses of a vacuum tube. A quotation from a memoir by Morlet gave the idea for the experiment, and Auguste de la Rive is credited with the design of the successful demonstration. *Subject Headings:* **1. Auroral models 2. Vacuum tube auroral experiments 3. History of auroral physics. I. de la Rive, Auguste II. Morlet.**—*M.R.* Ⓢ

12.5–130 551.507.23:551.594.5

McInnes, B., **Auroral observations made in ships.** *Marine Observer*, London, 30(189): 145–150, July **1960. DWB, DLC**—The work of the Aurora Survey of the Aurora and Zodiacal Light Section of the British Astronomical Association is described. One of their main preoccupations at the moment is to analyze the data collected up to the end of the IGY. The special value of ships' observations is stressed. Some suggestions of the procedure for making observations on ships are given. *Subject Headings:* **1. Aurora observation 2. Shipboard observation of auroras.**—*R.B.* Ⓢ

12.5–131 551.594.51

Frishman, I. G., **Raspredelenie energii v spektrakh poliarnykh siianii v oblasti 3900–8700 Å.** [Energy distribution in the Polar auroras in the region 3900–8700 A.] *Optika i Spetroskopiia*, Moscow, 6(3):323–328, March **1959.** 2 figs., 3 tables, 15 refs. **DLC.** Transl. into English in *Optics and Spectroscopy*, Cambridge, Mass., 6(3):208–210, March **1959.**—This article contains basic electrophotometric results of absolute brightness measurements of the strongest spectral emissions of the polar auroras in the 3900–8700 A region obtained at Murmansk during 1954–1957. The spectral energy distribution in that region for different auroral forms is derived from these measurements. The absolute brightnesses measured were corrected for absorption in the Earth's atmosphere. *Subject Headings:* **1. Polar aurora 2. Auroral energy 3. Murmansk, Murmansk Region, U.S.S.R.**—*Author's abstract.* Ⓢ

12.5–132 551.594.51

Hikosaka, Tadayoshi (*Physics Dept., Faculty of Science, Niigata Univ.*), **On the great enhancement of the line (01) 6300 in the aurora at Niigata on February 11, 1958.** *Japan. Science Council, Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 12(4):469–471, **1958.** fig., 2 eqs. **DWB, DLC**—This aurora was seen in the evening all over

north Japan. The spectrograph showed the intensity ratio between the line 6300 (OI) and the line 5577 (OI) as large as 20. The salient features of the aurora's display and the main characteristics of the spectrograph employed are described. A photoplate shows the microdensitometric trace of the spectra of the aurora. In the end the relationship of the great enhancement of the red line to the aurora mechanism is briefly discussed. *Subject Headings:* **1. Red auroral line 2. Niigata, Japan.**—*I.S.*

12.5–133 551.594.52:550.388.8

Kim, J. A. and Currie, B. W., **Further observations of the horizontal movements of aurora.** *Canadian Journal of Physics*, Ottawa, 38(10):1366–1375, Oct. **1960.** 3 figs., 3 tables, 12 refs. **DWB, DLC**—A previous paper (*see* 9.9–316, Sept. 1958, *Met. Abs*) showed that systematic motions of aurora parallel and normal to the geomagnetic meridians could be deduced from successions of all-sky camera photographs. More reliable deductions which are based on a much larger number of observations, including some from a station inside the auroral zone, are reported in this paper. Both southward and northward speeds increase with geomagnetic latitude to the auroral zone where they become constant, or even decrease slightly, before continuing to increase inside the auroral zone. A seasonal variation of north-south speeds does not appear to exist. A diurnal variation of north-south speeds, dependent on geomagnetic latitude, is evident, the speeds decreasing to a minimum during the morning hours to the south of the auroral zone and increasing to a maximum during the same hours to the north of the zone. Large positive correlations exist between north-south speeds and departures of the magnetic field intensity from normal. East-west speeds either decrease or remain constant with increasing geomagnetic latitude. A significant seasonal variation of east-west speeds is not evident. Eastward speeds are at a maximum between 03 and 04 hours L.M.T., and are associated with negative magnetic bays; westward speeds, between 21 and 22 hours L.M.T., and are associated with positive magnetic bays. *Subject Headings:* **1. Auroral drift 2. Geomagnetic-auroral relationships.**—*Authors' Abstract.* Ⓢ

12.5–134 551.594.52

†Bhattacharyya, B. K., **A study of auroral motions from all-sky camera records.** *Canadian Journal of Physics*, Ottawa, 38(10):1279–1290, Oct. **1960.** 6 figs., 18 refs. **DWB, DLC**—A study of horizontal motions of visual auroras as recorded by a 35-mm all-sky camera at Springhill (geographic 45.2°N, 75.5°W, geomagnetic 56.5°N, 6.9°W) near Ottawa has been carried out. The number of occurrences of motions in all the four geomagnetic directions, east, west, north and south appears to reach its peak within a range of speed from 0 to 150 m/sec and tends to decrease with increase in speed. Very large speeds seem more frequently to be associated with motions to the west and to the south. The distribution curve of speed with the time of night appears to have two peaks, one before and another after midnight, in all the four cases. Auroral motion is predominantly westward in the early part of the night and eastward in the late hours of the night. The reversal of motion from westward to eastward direction seems to be a systematic process, the declining and inclining portions of the two curves as a function of time meeting each other somewhat before local midnight. Auroral speeds either along or perpendicular to geomagnetic parallels of latitude increase nearly linearly with the horizontal and vertical components of the magnetic disturbance vector. *Subject Headings:* **1. Auroral drift 2. Springhill, Ontario, Canada.**—*Author's abstract.* Ⓢ

12.5–135 551.594.52

McInnes, B. and Robertson, K. A. (*both, Univ. Edinburgh*), **Latitude distribution and seasonal variation of aurora over the British Isles during 1957 and 1958.** *Journal of Atmospheric and Terrestrial Physics*, London, 19(2):115–125, Oct. **1960.** 9 figs., 4 tables, 10 refs. **DLC**—Visual auroral observations from the area of the British Isles for 1957 and 1958 are shown to give a latitude distribution which falls exponentially from the region of north Scotland southwards when plotted against geomagnetic inclination. The seasonal variation is shown to have March and September maxima. *Subject Headings:* **1. Auroral distribution 2. British Isles.**—*Authors' abstract.* Ⓢ

D4. GEOMAGNETISM

See: **Solar eruption in whole light** (Waldmeier), 12.5–102; **Variation in cosmic ray intensity and in geomag. activity** (Forbush), 12.5–124; **Solar daily variation of cosmic ray intensity** (Elliot, Rothwell), 12.5–126; **Horizontal movement of aurora** (Kim, Currie), 12.5–133; **Geomag. trapped electrons from an artificial source** (Welch, Whitaker), 12.5–143; **Lifetimes of trapped radiation belt particles** (Wentworth et al.), 12.5–144.

12.5–136 550.385.4:551.521.67

Pikelner, S. B. (*Astrophysical Obs., Crimea, U.S.S.R.*), **Some effects which can accompany magnetic storms.** (In: Lehnert, Bo Peter (*ed.*), **Electromagnetic phenomena in cosmical physics.** Cambridge Univ. Press, **1958.** p. 534–538. 8 ref.) **DLC** (QB461.L43) –Some effects are examined—the probability of penetration of a part of the flow of particles from the sun to the earth's atmosphere, as a consequence of the compression of the plasma—and formation of an electrical current along the motion of the plasma. Apparently, the main results of observations cannot be explained by these effects. But the latter may probably cause some secondary phenomena which could perhaps be discovered by means of special observations. *Subject Heading:* **1. Magnetic storm effects.**—*Author's abstract.*

12.5–137 551.521.67:550.38

Bartels, J., **The geomagnetic measures for the time-variations of solar corpuscular radiation, described for use in correlation studies in other geophysical fields.** *International Geophysical Year, 1957/1958 Annals*, Vol. 4:227–236, **1957. DWB**—A discussion on the effects of the two groups of variable electric currents from the solar ionizing radiations: wave radiations and particle radiations. From the K-indices for individual stations it has been possible to set up the geomagnetic measures for the time-variations of the solar corpuscular radiation to be used throughout the world during I.G.Y. *Subject Headings:* **1. Corpuscular radiation 2. Solar-magnetic relationships 3. Geomagnetic time.**—*N.N.*

12.5–138 550.38:523.7

Warwick, James W. (*High Altitude Observ., Univ. of Colorado, Boulder*), **Some remarks on the interaction of solar plasma and the geomagnetic field.** *Journal of Geophysical Research*, Wash., D. C., 64(4):389–396, April **1959.** 3 figs., 12 refs., 20 eqs. **DLC**—A brief review of the magnetohydrodynamic and ion-cloud theories of magnetic storms and auroras suggested some difficulties, principally connected with the small scale of magnetic disturbances from point to point on the earth's surface. Currents flowing in ion clouds closer than one earth's radius from the surface of the earth appear to be necessary to explain the difficulties. The principal conclusion of this paper is that such currents will flow in plasma sheets moving along the curved magnetic lines of force as a condition of dynamic balance of centripetal forces. Furthermore, these currents produce perturbation fields of the size and direction required to explain storm-time geomagnetic variations. The plasma involved is assumed to enter the region near the earth through "horns" in incident ion clouds. The material flowing into the horns follows the lines of force to the auroral zone. Finally, these horns are supposed to develop into sheets, mathematically generated by the rotation of a line of force to the auroral zone about the earth's magnetic dipole axis. Plasma flowing along such sheets performs trajectories that concentrate in the midnight hemisphere. The energies of auroral particles follow from the headlong collisions of such clouds in the night sky. *Subject Headings:* **1. Solar plasma-magnetic field relationships 2. Ion cloud theories.**—*Author's abstract.* Ⓢ

12.5–139 523.74:550.385

Warwick, Constance S. (*Nat'l. Bur. of Stand., Boulder, Colo.*) and Hansen, R. T. (*High Alt. Observ. Boulder*), **Geomagnetic activity following large solar flares.** *Journal of Atmospheric and Terrestrial Physics*, London, 14(3/4):287–295, June **1959.** 6 figs., 9 refs. **DWB, DLC**—Superposed epoch analysis of geomagnetic index around day of occurrence of large central flares shows a significant increase in geomagnetic activity following flares selected according to: (a) area of the flare and (b) "importance" of the flare. The association does not extend to flares of lesser "importance 2." During the period 1950–1954, near sunspot minimum and roughly the same period studied by WATSON, there was no tendency for geomagnetic disturbance

to follow within 2–3 days after the fourteen reported class 3 and 3+flares. *Subject Headings:* **1. Geomagnetic activity 2. Large solar flares geomagnetic activity relationships 3. Solar flares.**—*Authors' abstract.* Ⓢ

12.5–140 523.755:550.385

Warwick, Constance S. (*Natl. Bur. of Stands., Boulder, Colo.*), **Green coronal line intensity and geomagnetism.** *Journal of Geophysical Research*, Wash., D. C., 64(5):527–531, May **1959.** 9 figs., 11 refs. **DLC**—Climax Observatory spectrograms of the green coronal line, λ 5303, for the period 1942–1944 near solar activity minimum have recently been remeasured. Analysis of these revised intensities indicates that the most consistent feature in the relation of green line intensity to geomagnetism is a minimum in geomagnetic activity following central meridian passage (CMP) of regions of high green line intensity. This effect may be interpreted as a result of the tendency of solar activity regions to coincide with regions of high green line intensity and to avoid M regions. In the period October 1953 to October 1954, at sunspot minimum, no relation appeared between green line intensity and geomagnetic activity. *Subject Headings:* **1. Green coronal line intensity 2. Geomagnetic activity.**—*Author's abstract.* Ⓢ

12.5–141 523.753:550.385.22

Mustel', E. R. and Mitropol'skaia, O. N., **Flokkuly i dvadtsati-semidnevnaia povtoriaemost' geomagnitnykh vozmuschenii.** [Flocculi [plages] and the twenty-seven day recurrence tendency in magnetic disturbances.] *Astronomicheskiĭ Zhurnal*, Moscow, 35(2):194–207, March/April, **1958.** fig., table, 6 refs. English summary p. 195. **DLC.** Transl. into English in corresponding issue of *Soviet Astronomy AJ*, New York. **DLC**—The correlation between the 27-day sequences of geomagnetic disturbances during 1929–1933 and flocculi is studied. It is concluded that (a) the disturbances can all be connected with the passage of flocculi across the visible center of the solar disk, (b) in order to explain all the geomagnetic disturbances during 1929–1933 it is necessary to assume that in some cases the disturbances may also be observed when flocculi pass either below or above the center of the disk and that occasionally the ejection of corpuscular streams may not be accompanied by floccular emission, (c) the existence of a delay of the disturbances with respect to the instant when the corresponding flocculi pass the central meridian is fully confirmed (this delay may reach up to ten days, corresponding to speeds of 200 km/sec), (d) sunspots do not seem to have a large effect on the conditions of ejection of particles from flocculi but this must be confirmed during a maximum of solar activity. *Subject Headings:* **1. Solar flocculi data 2. Geomagnetic disturbance causes.**—*Physics Abstracts.*

D5. VAN ALLEN BELTS

12.5–142 551.507.362.2:551.521.67:539.1:621.039

[U. S. President's Science Advisory Committee], **White House reports on scientific aspects of radiation belts created by Argus experiments.** *Science*, Wash., D. C., 129(3354):949–951, April 10, **1959. DWB, DLC**—The President's Science Advisory Committee and the International Geophysical Year Committee of the National Academy of Sciences have presented reports of the three nuclear test explosions of Project Argus which were carried out on Aug. 27 and 30 and Sept. 6, 1958 by a Navy task force in the South Atlantic Ocean. This paper discusses the Christofilos proposal, the initiation of the Argus experiment, Explorer IV, the conduct of the Argus experiment, the auroral luminescence following the initial burst and rocket soundings. *Subject Headings:* **1. "Argus Experiment" 2. Van Allen belts 3. U. S. satellite 1958 Epsilon (Explorer IV) 4. South Atlantic Ocean. I. National Academy of Sciences, Wash., D. C. International Geophysical Year Committee.**—*N.N.* Ⓢ

12.5–143 551.594.12:550.38 551.510.536:539.1:621.039

Welch, Jasper A., Jr. and Whitaker, William A. (*both, Air Res. Dev. Command, Kirkland Air Force Base, New Mexico*), **Theory of geomagnetically trapped electrons from an artificial source.** *Journal of Geophysical Research*, Wash., D. C., 64(8):909–922, Aug. **1959.** 8 figs., 2 tables, 6 refs., eqs. "These remarks and other papers at Symposium are to be published in Aug. 1959 issue of *Proceedings of the National Academy of Sciences.*" **DLC**—Theoretical formu-

lation has been made for the history of an artificial shell of geomagnetically trapped electrons resulting from low-yielding nuclear detonations in the exosphere. The formulation assumes a source distribution and gives the spatial distribution of trapped electrons along the magnetic field lines, the drift rate around the world, and the configuration of the resulting shell. Interactions of the shell with the atmosphere lead to an electron density decaying inversely with time from injection for times longer than a characteristic lifetime that is a function of altitude and electron energy. The electron flux is found to be very nearly confined to a plane perpendicular to the field direction after several characteristic lifetimes. Scattering by geomagnetic fluctuations is probably not an important loss mechanism for the artificial shell, but it may be important for the hard component of the natural trapped belt. The effect of the geomagnetic anomaly over the south Atlantic has been described qualitatively. Jason rocket data and Explorer IV satellite data have been compared with the theoretical results. *Subject Headings:* **1. Trapped electrons 2. Van Allen belts.**—*Authors' abstract.* Ⓢ

12.5–144 551.510.62:551.521.64 551.594.12:550.388

Wentworth, R. C.; MacDonald, W. M. and Singer, S. Fred. (*all, Physics, Dept., Univ. of Md., College Pk.*), **Lifetimes of trapped radiation belt particles determined by Coulomb scattering.** *Physics of Fluids*, New York, 2(5):499–509, Sept./Oct., 1959. 8 figs., 4 tables, 13 refs., 30 eqs. **DLC**—Once introduced into captive orbits, protons and electrons should be strictly trapped in the earth's magnetic field. However, various mechanisms exist which limit their lifetimes, such as collisions with atoms and ions in the earth's outer atmosphere, charge exchange, and scattering by hydromagnetic waves. This paper considers only the effect of the scattering of these particles by the ionized hydrogen and electron components of the outer atmosphere. However, the effect of scattering from neutral atoms can be qualitatively taken into account by using the radius of the atom in place of the Debye shielding length in the scattering formulas. The Fokker-Planck equation has been used to derive an expression for the change in the distribution function due to small-angle, single-particle Coulomb collisions. Upper lifetime limits, as determined by this mechanism, of both protons and electrons are derived as functions of their initial energies. *Subject Heading:* **1. Van Allen belts.**—*Authors' abstract.* Ⓢ

E. SOLID EARTH GEOPHYSICS

1. VOLCANOLOGY

See also: **Suppression of thundercloud occurrence by volcanic eruptions, Japan** (Komabayasi), **12.5–334.**

12.5–145 551.21(573)

Naboko, S. I., **U podnozh' ia ognedyshashchikh gor; k 25-letiiu Kamchatskoĭ vulkanologisheskoĭ stantsii.** [At the foot of active volcanoes; 25th anniversary of the Volcanological Station in Kamchatka.] *Priroda*, Moscow, No. 16:1–69, Jan. **1960.** 10 figs. **DLC**—Contains the 25 year history of the scientific activity of the Kamchatka Volcanological Station organized in 1935 by Levinson-Lessing at the foot of the greatest active volcano Kliuchevskiĭ (4850 m high). Although Kamchatka and the neighboring Kuril Islands number about 70 active volcanoes, only the Kliuchevskiĭ, Sheveluch, Avach and Bezimiannyi are of real importance. However, Kamchatka is an exceptionally favorable region for the study of contemporary volcanism and the station at Kamchatka, which is equipped with the most modern instruments, carries on its work using the most recent methods of study. *Subject Headings:* **1. Volcanoes 2. Kamchatka, Asiatic U.S.S.R.**—*A.M.P.*

E2. SEISMOLOGY

12.5–146 550.34

Bullen, K. E., **Geophysics in Russia and China.** *Australian Journal of Science*, Sydney, 21(7):205–207, March/April, **1959. DWB, DLC**—The status of seismology in Russia and China is presented by firsthand observations and discussions, based on a study of official documents at the Institute of Earth Physics in 1956 and again in 1958; and at the Chinese

Institute of Geophysics in Peking in 1958. Sketched are the tasks of each of the 15 departments of the Moscow Institute connected with seismology. While Russia's distinguished reputation for seismological research has a tradition dating back to PRINCE GALITZIN'S famous work on seismometry published in 1914, seismological activity in China was relatively slight before the revolution of 1949. Although the Academia Sinica took steps toward placing geophysical studies on a firm footing, the development of seismology is still far from complete there, chiefly due to the lack of professionally educated and trained scientists. The planning seems to be on sound lines. The main seismological journals of both countries are quoted. *Subject Headings:* **1. Seismological research 2. U.S.S.R. 3. China.**—*O.T.*

12.5–147 550.341.2(52)

Suyehiro, S. (*Met. Res. Inst., Tokyo*), **Deep-focus earthquakes of small magnitude, Pt. 1, Results of continuous tripartite observation at Matsushiro.** *Papers in Meteorology and Geophysics*, Tokyo, 10(3/4):178–196, March **1960.** 15 figs., 4 tables, 6 refs., 3 eqs. English summary p. 178; Japanese summary p. 196. **DWB** The seismicity of shallow earthquakes has been investigated to a considerable extent; on the other hand little is known as to the seismicity of intermediate and deep-focus earthquakes. This is mainly because of the low sensitivity of the present network of seismological observation in Japan, which happens to be most suitable for the zones of intermediate and deep-focus earthquakes. In the seismograms recorded at Matsushiro by a sensitive electromagnetic seismometer, however, many shocks which are small and probably deep have been found, and an example is presented. In order to detect those small deep shocks, a new method of estimating focal depth and epicentral distance by means of S-P time and apparent velocity, which can be observed by a multi-point observation of comparatively small dimensions, is proposed and discussed, since the highly sensitive observation cannot be allowed in most of the present recording stations owing to high background noise. Thus, a continuous tripartite observation to find the apparent velocity and direction of seismic propagation was started at Matsushiro in June, 1959. Instruments employed in this observation are described, particularly the improved film recorder, on which observational accuracy largely depends. The observation results and the seismicity of small but deep shocks will be published in the next paper under the same title. *Subject Headings:* **1. Earthquakes 2. Matsushiro, Japan.**—*Author's abstract.*

12.5–148 550.341.7

Inouye, W. (*Met. Res. Inst., Tokyo*), **On the long waves accompanied by the T-phase of seismic waves.** *Papers in Meteorology and Geophysics*, Tokyo, 10(3/4):167–177, March **1960.** 7 figs., 7 refs., 2 eqs. English summary p. 167; Japanese summary p. 176–177. **DWB**—In some earthquakes, a prominent wave group of long period accompanied by the T-phase of seismic waves was observed in the records taken by the Wiechert seismographs at the coastal stations at Shinomisaki, Shimizu, Wajima, etc. The period of the long waves is 7.5–15 sec., while that of the T-phase is 0.2–1.4 sec. The T-phase of seismic waves may be the free waves whose pressure amplitudes are concentrated in the sound channel, so that it may be dispersive. The long waves seem to be the oceanic Rayleigh waves, corresponding probably to the rider waves of Pekeris. The wave train of long period under consideration is so prominent that it seems the T-phase and the long waves should be connected with each other in a certain way. The present writer showed that a kind of coupling between the dispersive short waves and the dispersive long waves was possible, if the group velocities of the two waves were the same and the condition

$$\frac{cT}{c-U} = \frac{c'T'}{c'-U'}, \qquad \text{where} \qquad U = U',$$

was satisfied. For an example, it is shown that the T-phase with a period 0.5 sec. and the oceanic Rayleigh waves with a period 10 sec. may be connected with each other, almost satisfying the condition cited above. In the case of the Sanriku earthquake of 1933, only the long waves, which may be the rider waves, were observed at Choshi and Kakioka. *Subject Heading:* **1. Seismic waves.**—*Author's abstract.*

12.5–149 551.21(72)

†Richards, Adrian F. (*U. S. Navy Hydrographic Off., Wash.*, D. C.), **Geology of the Islas Revillagigedo, Mexico, Pt. 1, Birth and development of Volcán Bárcena, Isla San Benedicto.** *Bulletin Volcanologique*, Naples, Ser. 2, 22:73–123, **1959.** 5 figs., 28 photos, 5 tables, 46 refs. **DLC**—On Aug. 1, 1952, a new volcano named Bárcena was born on Isla San Benedicto, which is located about 300 nautical miles off the west coast of Mexico. A pyroclastic cone nearly 1100 feet above sea level was formed by Aug. 2. By mid-September cone formation had ceased and a small lava plug capped the magma conduit in the crater. After a period of quiescence from mid-September until early November activity resumed and blocky, soda trachyte lava formed two domes in Bárcena crater during November and early December. On Dec. 8 lava flowed through the base of the volcano and formed a delta nearly one-half mile out to sea by the end of February 1953. All activity, except solfataric steaming, stopped by this date. Volcanic density flows («nuees ardentes») descended the cone during the period of cone formation. As the expulsion of ash and steam decreased in early September, 1952, the exterior of the cone is believed to have been furrowed by these avalanches. Volcán Bárcena has an index of explosiveness of about 90 percent, the highest of any known oceanic volcano in the eastern Pacific Ocean. Calculations indicate that about 10,500 million cubic feet (300 million cubic meters) of tephra and lava were erupted during the life of Bárcena. *Subject Headings:* **1. Volcanoes 2. Volcán Bárcena, Isla San Benedicto, Mexico.**—*Author's abstract.*

12.5–150 550.342

Nanda, J. N. (*Naval Headquarters, New Delhi*), **The origin of microseisms.** *Journal of Geophysical Research*, Wash., D. C., 65(6):1815–1820, June **1960.** 10 refs., 24 eqs. **DLC**—In 1944 MICHE developed a theory to explain the production of a bottom pressure due to standing waves on the surface of the sea, and in 1950 LONGUIT-HIGGINS accounted for microseisms by widespread in-phase pressure oscillations. According to this theory the groups of waves moving in opposite directions, generated by storms or by wave action near the coastline give standing waves. In this paper an alternative origin is suggested. It is the action of suitably-oriented winds with rough sea surface. The author has earlier described the sea roughness as having a certain periodicity. Such periodicity can be caused by the existence of standing waves, but it can also arise in other ways; for example, the amplitude of the progressive waves might be a periodic function of time, the period being the same as the period of the corresponding microseisms. In such a case the interaction of the convergent winds under a storm, or of winds parallel to a coastline, will bring about oscillations in the sea surface which will be transmitted through the ground as microseisms. The wind interaction term is about 1/100 of the MICHE term, but still this is more than that required to account for the observed microseisms. The amplitude is inversely proportional to the depth of the sea, and is very sensitive to the speed of the oriented winds. *Subject Heading:* **1. Microseism origin.**—*Author's abstract.*

F. OCEANOGRAPHY, HYDROLOGY AND GLACIOLOGY

F1. OCEANOGRAPHY

See also: **Code for transmission of weather and sea obs.,** 12.5–18; **Origin of microseisms** (Nanda), 12.5–150; **Ocean-atmos. exchange** (Welander), 12.5–237; **Relation between sea waves and surface wind speed at O.W.S. "Tango,"** (Yamagata), 12.5–282; **Underwater light measurements, Bay of Biscay** (Boden et al.), 12.5–289; **Oceanogr. conditions and sea ice, Ohkhotsk Sea** (Akagawa), 12.5–297; **Forecast of water temp. east of Tohoku, summer 1957** (Hakodate Marine Observatory), 12.5–298; **Drawing wind field charts for oceans** (Sorkina), 12.5–307; **Effect of wind on coastal water levels** (Miller), 12.5–313; **Ekman's generalized theory** (Sait-Guily), 12.5–314; **Charts of mean surface water temps., Sea of Japan,** 12.5–372.

12.5–151 551.506.5:551.46(541.9,267)

*Das, P. K. and Dhar, N. C. (*Meteorological Office, Poona*), **Meteorological and oceanographic observations on I.N.S. Investigator (March–April 1952).** *Indian Journal of Meteorology and Geophysics*, New Delhi, 5(1):16–28, Jan. **1954.** 6 figs., 4 tables, refs. **DWB, DLC**—This

paper describes the observations taken on I.N.S. "Investigator," during the ship's last surve season in the Andaman Islands. The work done during the voyage was (a) measurement temperature, density and salinity in the surface waters of the Arabian Sea and Bay of Beng and (b) measurement of the humidity wind gradient in the lower layers of the atmosphe above the sea. The observations of salinity during the voyage have been compared with t earlier work of SEWELL (1938). In addition, attempts have been made to estimate evaporatio from the observations of humidity gradient. The wind observations have also been analyze to see what agreement they give with ROSSBY's earlier results. *Subject Headings:* **1. Ocean graphic data 2. Meteorological data 3. Arabian Sea 4. Bay of Bengal.**—*Authors' abstrac*

12.5–152 551.462(26

†Stocks, Theodor, **Zur Bodengestalt des Indischen Ozeans: Bericht über den gegenwärtige Stand der Forschung.** [On the submarine topography of the Indian Ocean: a report on t present state of exploration.] *Erdkunde*, 14(3):161–170, Aug. **1960.** 2 figs., table, re English and German summaries p. 161–162. **DLC**—The Indian Ocean floor shows a centr ridge with a longitudinal extension of some 13,000 km. It originates in the neighborhood the Gaussberg in the South (Antarctica) and extends beyond the equator. At that point splits into two branches: the Chagos-Laccadive ridge, and the so-called "Carlsberg" (northwe Indian) ridge. The Indian ridge divides into several remarkable branches. The details the topography of these branches and of the bottom configuration of the Indian Ocean flo are discussed. *Subject Headings:* **1. Submarine topography 2. Indian Ocean.**—*I.S.*

12.5–153 551.521:551.524:551.526.6(26

Strokina, L. A., **Teplovoĭ balans Severnoĭ Atlantiki.** [Thermal balance of the Nor Atlantic.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 92:27–49, 195 63 refs., 8 refs. Russian summary p. 27. **DWB**—The problems of the distribution of t mean long period components of the heat balance of the North Atlantic are examined on t basis of calculations made by using new climatologic data on the distribution of meteorologic elements as determined by the methods of climatological computations of the constituents the heat balance developed by M. I. BUDYKO, T. G. BERLIAND and L. I. ZUBENOK and the da given in the U. S. Navy Marine Climatic Atlas. The article presents maps giving mea monthly values and annual totals of total radiation, radiation balance, heat loss by evaporatio turbulent exchange of the ocean surface with the atmosphere; an annual map of heat receive or lost by the ocean surface as a result of the action of oceanic currents and graphs of the annu variation of the components of heat balance in climatic regions of the North Atlantic. On t basis of radiation balance, the Atlantic is divided into three climatic zones, namely: equa torial, tropical and middle latitudes zones and the variations of the components of radiatio balance within these zones and their several subzones are analyzed. *Subject Headings:* **1. The mal balance of water surfaces 2. Oceanic heat budget 3. North Atlantic.**—*Author's abstra and I.L.D.*

12.5–154 551.46.018.4:551.526.6:551.508.2

Srivastava, S. S. and Ramam, K. V. S. (*both, Indian Naval Phys. Lab., Cochin*), **Portabl thermistor thermometer for estuarine investigation.** *Current Science*, Bangalore, 28(9) 362–363, Sept. **1959.** fig., 2 refs. **DWB, DLC**—A short note reporting the development of portable thermistor thermometer which could be used for continuous measurements of tem peratures for hydrologic studies in estuaries 50 to 100 ft deep. It was used to measure tem perature variations in the Ernakulam channel to a depth of 30 ft. Thus, this device fulfils th need for accurate measurements in shallow water channels. The apparatus of the thermomete is described and the possibility of its use for various other situations is discussed. *Subje Headings:* **1. Thermistor thermometers 2. Estuarine hydrography 3. Sea temperatur measurement techniques.**—*I.S.*

12.5–155 551.506.22:551.501.9:551.326.7(9

Tressler, Willis L. (*U. S. Navy Hydrographic Office*), **Oceanographic observations at IG Wilkes Station, Antarctica.** *American Geophysical Union, Transactions*, 41(1):98–104, Marc **1960.** fig. **DWB, DLC**—As part of the IGY scientific program in Antarctica, studies wer

conducted during 1957–1958 at US-IGY Wilkes Station on floating ice, currents, tides and bottom sediment. Some hydrographic and bottom topography survey work was also carried out. This paper presents a systematic survey of the activities at Wilkes Station. First, a description of the region and of the weather conditions are given. Then sea ice studies, tide records, currents and bottom sediments are described. A map of the area illustrates the report. *Subject Headings:* **1. IGY oceanographic program 2. Drift ice 3. Ocean currents 4. Tides 5. Bottom sediments 6. Wilkes Station, Antarctica.**—*I.S.*

12.5–156 551.526.6:551.464(99)

Bunt, J. S. (*Microbiology Laboratories, School of Agri., Univ. of Sydney*), **Marine studies in the inshore waters of Antarctica near Mawson, 1956.** *Nature*, London, 183(4674):1541–1542, May 30, **1959. DWB, DLC**—Some preliminary results of the 1956–57 Australian National Antarctic Research Expedition to Mawson (67°31′S lat., 62°53′E long.) are discussed here, covering regular observations at weekly intervals in the period June 1956–Feb. 1957. Observations to a depth of 25 m at one station and to a depth of 100 meters at another station included: plankton, phosphates, oxygen, chlorinity, temperature, ice crystal formation, submarine solar radiation, etc. Chlorinites of 16.00 to 18.7‰ combined with temperatures −1.90° and −1.60°C. Ice crystal formation in free suspension was seen. Evidence for an exchange process between water of different salinity content was found. *Subject Headings:* **1. Australian National Antarctic Research Expedition, 1956–1957 2. Antarctic marine research 3. Mawson, Antarctica.**—*W.N.*

12.5–157 551.465(261.2)

Van Dantzig, D. and Lauwerier, H. A., **The North Sea problem. General considerations concerning the hydrodynamical problem of the motion of the North Sea.** *Akademie van Wetenschappen te Amsterdam. Afdeeling voor de Wis- en Natuurkundige Wetenschappen, Proceedings, Ser. A, Mathematical Sciences*, 63(2):170–180, **1960.** 2 figs., 16 refs., eqs. **DLC, CU**—After the floods which devastated the SW of the Netherlands on Feb. 1, 1953, the government of that country created a committee (Delta-Committee) for studying the possibility of more elaborate tide-race forecasts to protect the low areas from inundation. The Mathematical Center contributed to this study by investigating the movement of the North Sea from the hydrodynamic point of view. The article gives the first results of this study. An adequate mathematical treatment of the hydrodynamic problem is only possible at the cost of a number of simplifications, the majority of which hardly affect the final result. In the first place the hydrodynamic equations are simplified. The vertical component of the velocity of the stream is neglected, the equations are linearized, and the coefficient of Coriolis force is assumed constant. For the North Sea basin these simplifications are quite acceptable. In the second place, the form of the basin is replaced by a simple mathematical model. This implies that the influence of irregularities of the coast and of variations of the depth are neglected. The rectangular model suffers from two disadvantages. In the first place the leak of the Channel is neglected. In the second place the assumption of a uniform depth is rather drastic. With these simplifications the problem can be described by an elliptic partial differential equation with oblique boundary conditions. A number of partial results which are obtained at the Mathematical Center will be reported in this and the following papers. *Subject Headings:* **1. Oceanographic research 2. Ocean current dynamics 3. Oceanic circulation 4. North Sea.**—*Authors' abstract.*

12.5–158 551.46.018.3:551.465

Chernyshev, M. P., **Izmerenie napravleniia i skorosti morskikh techeniĭ s berega.** [Measurement of the direction and speed of sea currents from the shore.] *Meteorologiia i Gidrologiia*, Moscow, No. 6:35–37, June **1960.** 2 figs. **DWB, DLC**—The various methods of visual measurement from shore of the currents in the Kerch Strait are described in detail and illustrated. The velocity and direction of the current are indicated by the angle and movement of the vertical floating "pole-buoy" chained to the anchor at a definite position on the bottom of the Straight. The velocity is computed with a special formula and the known characteristics of the "pole-buoy" determined in advance (weight and volume of float, distance from the

anchor, density of water, etc.). The angle and movements of the "pole-buoy" are observed from the shore with graduated optical instruments. The measurements from the shore are compared with the values obtained with regular instruments. The accuracy varies with the velocity of current and is about 73% to 83%. The currents are also measured by a new floating "pole-buoy" device equipped with electric battery and bulbs, flashing each revolution of the submerged velocity indicator. *Subject Headings:* **1. Sea current measurement technique 2. Visual observation of sea currents 3. Kerch Strait, European U.S.S.R.**—*N.P.S.*

12.5–159 551.46

Ichiye, Takashi (*Florida State Univ.*), **A theory of vertical structure of density in the ocean.** *Oceanographical Society of Japan, Tokyo, Journal*, 14(2):35–40, June **1958.** 3 figs., 6 refs. 36 eqs. **DWB**—This paper presents a theory of vertical structure of density in the ocean. The fundamental equations of motion are developed and solution of a nonviscous model and solution of a viscous model are expressed. It is noted that the density structure has a simple profile. Reference is made to STOMMEL (1955, 1957, 1957b). *Subject Heading:* **1. Sea water density distribution.**—*E.Z.S.*

12.5–160 551.509.33:551.46

Takenouti, Yositada, **Long-range oceanographic forecast: historical review and future problem.** *Oceanographical Magazine*, Tokyo, 9(1):1–12, Sept. **1957.** table, 18 refs. **DWB, DLC**—The development of oceanographic forecasting in Japan, especially in the Central Meteorological Observatory (now Japan Meteorological Agency) is surveyed. The systematic forecasting in Japan began in 1949. The forecasting methods since then, employed each year in the Central Meteorological Observatory and the Marine Observatories, are tabulated and discussed. The results obtained from these are summarized. It is found that the oceanographic forecast has been generally successful for these several years. The conclusion points out the need for further studies investigating the variation of oceanographic conditions in order to develop the present qualitative forecast system into more reliable numerical oceanographic forecasting. *Subject Headings:* **1. Oceanographic forecasting 2. Long range forecasting 3. Japan.**—*I.S.*

12.5–161 551.509.58:551.526.

Sugiura, Jiro (*Hakodate Marine Observatory*), **Forecast of water temperature in the sea south of Hokkaido.** *Oceanographical Magazine*, Tokyo, 9(1):13–19, Sept. **1957.** 10 figs. 4 refs. **DWB, DLC**—On the basis of oceanographic data obtained by the Hakodate Marine Observatory for the years 1950–1956, the present paper discusses the possible relationship between the water temperature in midsummer and hydrography in early spring. Three assumptions concerning the relationship between hydrographical observations in early spring and the problem of forecast of summer sea temperature are listed and examined in the light of available data. Several graphical representations of relevant data illustrate the text. The results are described as inconclusive and the difficulties connected with the problem are enumerated. *Subject Headings:* **1. Forecasting summer sea temperatures 2. Hokkaido Coast, Japan.**—*I.S.*

12.5–162 551.509.58:551.465:532.59

†Pierson, Willard J. Jr., **Study of wave forecasting methods and of the height of a full developed sea on the basis of some wave records obtained by the O.W.S. Weather Explorer during a storm at sea.** *Deutsche Hydrographische Zeitschrift*, Hamburg, 12(6):244–259, Dec. **1959.** 8 figs., 5 tables, 19 refs. English, German and French summaries p. 244. **DWB, DLC**—The growth of the waves in a storm in which the wind speed increased from 25 knots to 64 knots and in which the significant waves grew from 6 feet to 42 feet as recorded by the O.W.S. Weather Explorer is studied. Spectra computed from the records are compared with the results of J. DARBYSHIRE, C. BRETSCHNEIDER and G. NEUMANN. The spectral forms given by NEUMANN for partially developed seas do not agree with the observed spectra, although the height forecasts are good. The results indicate that the height of a fully developed sea as a function of wind speed as given by NEUMANN is an overestimate. They also suggest that the

data studied by DARBYSHIRE do not correspond to fully developed seas for the higher wind speeds and that the height of a fully developed sea as given by DARBYSHIRE is an underestimate. *Subject Headings:* **1. Ocean wave forecasting techniques 2. Wave recording.**—*Author's abstract.*

12.5–163 551.596.1:534.2:551.464

Froese, Charlotte (*Dept. of Math., Univ. British Columbia, Vancouver, B. C.*), **On the calculation of the velocity of sound in sea water.** *Canadian Journal of Physics*, Ottawa, 37(6): 775–779, June **1959.** fig., 4 tables, 2 refs., 4 eqs. **DWB, DLC** —An accurate knowledge of the velocity of sound in sea water as a function of salinity, temperature, and pressure is essential in oceanography. Tables are available but the values quoted may differ by as much as 3 m/sec from one table to the next, when the desired accuracy is to within 0.1 m/sec. Of these tables, the two most frequently used are by KUWAHARA (1939) and by DEL GROSSO (1952). KUWAHARA computed the sound velocity, V_{stp}, as a function of salinity, temperature and pressure. His calculations were based on theoretical considerations which express the sound velocity in terms of specific heat, specific volume, and compressibility of sea water. Empirical formulas were derived for these physical properties, and so the accuracy of his tables will depend mainly on the accuracy of these formulas. More recently DEL GROSSO (1952) measured the velocity of sound at atmospheric pressure experimentally using modern interferometric techniques. From these results he derived an equation for V_{st0} which he believes to be accurate to within 0.2 m/sec. Sound velocities at pressures up to 1000 atmospheres are currently being measured. These direct measurements are capable of greater precision than the indirect method of KUWAHARA, and at the moment a considerable discrepancy exists between the two. For example, for $V_{35,0,0}$ DEL GROSSO obtained a value 3.1 m/sec higher than the one given by KUWAHARA. This discrepancy is an indication of the error present in the empirical formulas used by KUWAHARA. Some of them were based on measurements made as far back as 1889 and could be determined now with greater accuracy. The purpose of this investigation was, first of all, to check KUWAHARA's tables by using the same basic formulas but employing a different method. A program was written for ALWAC III-E, the automatic computer at the University of British Columbia, to perform the calculations. This program would also serve another purpose; as new measurements are made of the specific heat, specific volume, or compressibility, the same program may be used to recompute the sound velocity and compare the results with direct measurements. This paper deals entirely with the results of the first stage of the investigation. A description is given of the method by which the sound velocity was computed and the results compared with KUWAHARA's tables. *Subject Headings:* **1. Acoustical propagation in sea water 2. Sound velocity measurement.**—*Author's abstract.*

12.5–164 551.515.1:551.465(265)

Sugiura, Jiro (*Hakodate Marine Obs.*), **Oceanographic conditions in the northwestern North Pacific based upon the data obtained on board the "Komahashi" from 1934 to 1936.** *Oceanographical Society of Japan, Tokyo, Journal*, 14(3):81–85, Oct. **1958.** 3 figs., table, 10 refs. In Japanese; English summary p. 81. **DWB**—(1) The volume transport (above 1500 m) of the Oyashio Current in the seas adjacent to the southern Kurile Islands amounts to about 15 million m^3/sec, and one-third of the transport is derived from the Okhotsk Sea, another one-third from the Bering Sea, and the last one-third belongs to the cyclonic eddy which is always located off the middle Kurile Islands. (2) The transport (above 1500 m) of the westward current south off the Aleutian Islands amounts to about 10 million m^3/sec. (3) Both currents above mentioned from the parts of a large cyclonic circulation in the northwestern North Pacific. *Subject Headings:* **1. Cyclonic circulation in oceans 2. Oceanic circulation 3. Northwestern North Pacific Ocean.**—*Author's abstract.*

12.5–165 551.46(438):06

Szymborski, Stanisław (*Sopot*), **Stan i rozwój oceanologii w Polsce Ludowej.** [State and development of oceanology in Poland.] *Przegląd Geofizyczny*, Warsaw, 4(3/4):272–274, **1959. DWB, DLC**—The development of oceanology in Poland in the post-war period proceeded in the 3 stages: from 1945 to the 1st All-Polish Conference of Polish Science in 1951 in which

problems of oceanology were not given the attention they deserved and activities in this field were casual and unplanned; the 2nd stage which lasted till May 1956 was characterized by somewhat greater activity—investigations and observations in the open Baltic Sea were carried out by the Sopot Sea Station of the Polish Academy of Sciences. The 3rd stage was highlighted by the participation of Poland in the International Geophysical Year and the all-Polish Oceanological Conference at Sopot in 1956 which drew up a broad program of studies and scientific oceanological exploration. It is still too early to assess the results of these activities. *Subject Headings:* **1. Oceanology 2. Progress in oceanography 3. Poland.**—*A.M.P.*

12.5–166 551.465:532.593:627.2

†Wilson, Basil W., **Origins and effects of long period waves in ports.** *Permanent International Association of Navigation Congress, Brussels, 1957,* [*Proceedings, Unnumbered Paper*], 49 p. 23 figs., bibliog. p. 318–321, 13 eqs. French summary p. 47–49. **DWB.** Reprinted as *Texas A. and M. College. Dept. of Oceanog. and Meteorology, Contributions in Oceanography and Meteorology,* 3(60-89):275–323, 1955–1957. Issued **1958. DWB** -The author has described, with illustrative material, the following: effects of long period waves in harbors, phenomenon of seiches, influence of tsunami waves, ocean waves and surf beats, existence of long ground swells, hypothesis associating ground swells with cyclonic storms, importance of fluctuating wind and atmospheric pressure, squall lines and surges, edgewaves and oscillation of beaches, origins of long period waves, mechanism of seiches in harbors and other aspects of the effects of long period waves in ports. *Subject Headings:* **1. Long period wave effects on harbors 2. Seiches in harbors 3. Tsunamis.**—*N.N.*

12.5–167 551.511:551.515.1:551.461.2:593.14:599.5

Beklemishev, K. V., **Antarkticheskaia divergentsiia i polia pitaniia kitov.** [Antarctic divergence and feeding grounds of whales.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geog.,* No. 6:90–93, Nov./Dec. **1959.** 2 figs., 12 refs. **DWB**—The author presents an analysis of the investigation of the upwelling of water in the Antarctic divergence obtained in 1957 during the second voyage of the "Ob" northward from Enderby Land (between 40 and 60° east long. and 60 and 68° south lat.). By averaging the pressure of cyclonic fields around Antarctica a pressure trough is obtained, which determines the zone of Antarctic divergence bordering almost the entire Antarctic along 65° south lat. except the Weddell Sea to the south from 30° west long. The whales feed in Antarctic waters on the *kryee Euphausia superba* which inhabits the intermediate warm layer and which rises to the surface in the Antarctic divergence zone. In the region of rapid upwelling of water between 60° and 64° south lat. north of Enderby Land the upwelling of deep water is much greater than to the north and west. The rapid upwelling north of Enderby Land, 8.2 cm/sec, does not permit the development of "florescence" and the biomass of algae is small. Where the phytoplankton does not develop the large masses of *Euphausia* are present. The cyclones causing upwelling of water in the zone of Antarctic divergence favor the occurrence of *Euphausia* and the accumulation of whales. The presence of cyclones leads to uneven circulation at the Antarctic divergence so that upwelling is not continuous so that the size of water is followed by a fall. Quasistationary cyclones bring about stable elevation of water. In 1954–1955 the principle places of whale hunting were as follows, viz: in the eastern drift between 20° west long. to 20° east long., in the western drift between 30° and 60° east long. and between 80° and 90° east long. and also north of the Ross Sea. *Subject Headings:* **1. Divergence 2. Upwelling 3. Nutrient areas 4. Whale feeding grounds 5. Antarctica.**—*I.L.D.*

F2. SEA ICE

See also: **Ice research on rivers and reservoirs** (Rymsha), 12.5-5; **Ice obs., Antarctica** (Tomashunas), 12.5–35; **Ice around Showa Base** (Ono), 12.5–36; **Oceanogr. conditions and sea ice, Ohkhotsk Sea** (Akagawa), 12.5–297.

12.5–168 551.509.58:551.326.7

Wittmann, Walter I. (*U. S. Navy Hydrographic Office, Wash., D. C.*), **Continuity aids in short range ice forecasting.** *National Research Council, Wash., D. C., Publication,* No. 598

244–257, Dec. 1958. 10 figs., 11 refs., 4 eqs. **DLC, DWB** (551.311 A675pr)—For the purposes of this paper a short-range ice forecast is defined as an attempt to describe expected pack ice conditions for periods from 1–30 days duration. The paper demonstrates that reasonable general estimates and predictions of ice thicknesses and concentrations may be made over the entire Northern Hemisphere on the basis of the only three types of synoptic data that are readily available at the present time. These types are aerial ice reconnaissance, surface atmospheric pressures and surface air temperatures. The study is extensively illustrated by graphs. *Subject Headings:* **1. Short range ice forecasting 2. Northern Hemisphere.** —*I.S.*

12.5–169 551.509.58:551.326.7

Kurasina, S., **Sea ice observation and drift-ice movement prediction.** *Japan. Maritime Safety Board, Hydrographic Bulletin,* No. 61:45–49, Oct. **1959.** 5 figs., 3 tables, 5 refs. In Japanese; English summary p. 45—Sea-ice observations on the coast of Hokkaido and the Sea of Okhotsk that had been temporarily suspended since 1945 were undertaken again in 1951. Keeping pace with the increased needs of navigation and the study of the Oyashiio Current the method of observation was gradually transformed and strengthened and since 1957 the results have been conspicuously improved with the drift-ice observation over a wide area carried out by aircraft belonging to the Maritime Safety Board. Moreover, the oceanographic observation of the Sea of Okhotsk was carried out in winter for the first time, and the study of the movement of ice-area was predictively worked out from the state of the current and the movement of drift-ice area by the wind. *Subject Headings:* **1. Sea ice observations 2. Forecasting drift ice movement 3. Hokkaido Coast, Japan 4. Okhotsk Sea.**—*Author's abstract.*

12.5–170 551.509.58:551.326.7(98)

Tait, Albert J. (*Military Sea Transportation Service, Wash., D. C.*), **The operational concept for a sea ice reconnaissance and forecasting program conducted during Arctic operations.** *National Research Council, Wash., D. C., Publication,* No. 598:265–266, Dec. **1958. DLC, DWB** (551.311 A675pr)—The paper reviews the past and current Arctic airlift program from the "consumers" approach, the consumer, in this case, being the U. S. Navy's Military Sea Transportation Service. One of MSTS' special projects is the annual sealift into areas of the U. S., Canadian and Greenland Arctic. Beginning in 1950 with 37 ships deployed to the Arctic, MSTS has continued an annual cargo and fuel lift by sea to the polar posts and to adjacent over-the-beach landing sites. The paper traces the progress and improvements made since 1950. To meet the needs efficiently, the present concept of an ice reconnaissance and forecasting program was evolved. This greatly increased the ability to meet Arctic sealift requirements with a minimum of ice damage. Effective plans can also be formulated at a much earlier time in the planning cycle, thus enabling the realization of material savings in ship utilization. *Subject Headings:* **1. Arctic airlift program 2. Ice reconnaissance 3. Ice forecasting 4. Arctic.**—*I.S.*

12.5–171 551.511.33:551.326.7:536.421.1

Akagawa, M., **On the melting of pack-ice field.** *Journal of Meteorological Research,* Tokyo, 11(11):921–932, **1959.** 8 figs., 15 refs., 16 eqs. In Japanese; English summary p. 921. **DWB, DLC**—Generally, it is well known that the melting of sea ice is mainly due to the distribution of air temperature, sea water temperature and insolation, and also sea wave. Uda (1943) showed theoretically that the melting course of a single piece of sea ice such as an iceberg, growler, ice floe or the like follows closely the probability curve of the parabolic curve, namely: the disintegration of ice temperature, sea water temperature and velocity of ice drifting, and eddy heat conductivity between air, sea water and ice are considered. However, the melting of a pack-ice field consisting of various sizes of floes which form an ice-field, patch or stream is somewhat different from that of a single piece of sea ice described above; that is, as Zubov (1945) has indicated, the concentration of an ice-field has an important role in the melting process, because sea water among ice floes is thermally effective when ice floes melt away. From this point of view, the author examined the relationship between the melting of pack-ice and the concentration of its ice-field using the thermal equilibrium equation by Zubov (1945).

Then, assuming that variation of concentration of ice-field is chiefly caused by Fick type diffusion of pack-ice floes on drifting course, he discussed the melting of pack-ice off the seashore of Kushiro, particularly in 1955. Consequently, it is shown that the rapid decrease of relief of ice follows the sudden variation of concentration of ice-field. *Subject Heading:* **1. Melting of pack ice field.**—*Author's abstract.*

12.5–172 551.501.3:551.326.6

Nazarov, V. S., **Shkala dlia nabliudeniia nad aisbergami.** [Scale for iceberg observations.] *Meteorologiia i Gidrologiia*, Leningrad, No. 2:54–55, Feb. **1959.** table. **DWB, DLC**—The author presents an 11-point (0–10) scale for frequency of occurrence of icebergs for scientific and navigational purposes. Table also gives distance between icebergs in miles. The point system is already being used by the Antarctic Expedition of the Academy of Sciences of the U.S.S.R. The record in points should be accompanied by notes on shape and predominating features of icebergs. *Subject Heading:* **1. Iceberg observation scale.**—*I.L.D.*

F3. GLACIOLOGY

See also: **Greenland Ice Cap investigation** (Fristrup), 12.5–30.

12.5–173 551.324.5 551.324.24(988)

*†Nobles, Laurence H., **Glaciological investigations on the Nunatarssuaq Ice Ramp, northwestern Greenland.** *U. S. Snow, Ice, and Permafrost Research Establishment, Technical Report*, 66, May **1960.** 57 p. 42 figs., 9 tables, 34 refs. **DWB, DLC**—These investigations were conducted from 1953–55 on a gently sloping ice mass of 8 sq mi extent that forms part of the margin of the Greenland Ice Cap. The ice has a subpolar thermal regime with a constant temperature of −14 C° at 25 ft. All runoff is on the surface forming slush avalanches, algal pits, and an integrated drainage pattern. The firm limit is at 3000 ft elevation. The ramp has a strongly negative budget balance, with local ablation as high as 25 in. of water equivalent. Velocities of ice movement range up to 2 in. per day with the vertical angle of the movement vector never deviating from the horizontal by more than 5°. Budget and movement studies suggest complete decay of the ramp in 300 to 600 yrs. under present climatic conditions. Metamorphic structures of both tensional and shear origin are common and include foliation, blue bands, amber bands, joints, small crevasses and ice dikes. The military trafficability of the ramp is discussed in the appendix. *Subject Headings:* **1. Glaciological observations 2. Nunatarssuaq, Greenland.**—*SIPRE abstract.*

12.5–174 551.578.46:551.324.4(234.3)

†Hoinkes, Herfried, **Das glazial-meteorologische Forschungsprogramm in den Ötztaler Alpen.** [The glaciological-meteorological research program in the Ötztaler Alps.] *Germany. Deutscher Wetterdienst, Berichte*, 8(54):8–13, **1959.** 47 refs. German summary p. 8. **DWB, DLC**—The observations on the dimensions of the glaciers of the Ötztaler Alps carried out during the past 70 years and the history of meteorological observations in the region of the glaciers, which began in 1895, are reviewed. Since 1948 a new phase in glacial-meteorological research was begun. This included a study of the relationship between precipitation and snow cover in order to interpret better the totalizers; the energy budget of the glacier (radiation balance and micrometeorology of the air layer near the ice) at different heights from the glacier's tongue to the firm region and supplementing the mass budget of at least one glacier, involving snow deposition and ablation, by runoff measurements in the immediate vicinity of the terminal point of the glacier. The methods of investigating these problems and the results obtained during the past 10 years are summarized. *Subject Headings:* **1. Glacier-meteorological observations 2. Glacier studies 3. Ötztaler Alps.**—*I.L.D.*

12.5–175 551.32:91.04(988)

Møller, J. Tyge, **Glaciers in Upernivik Ø, with special reference to the periglacial phenomena.** *Geografisk Tidsskrift*, Copenhagen, 59:30–53, **1959.** 9 figs., 13 refs. **DWB**—An extensively illustrated and descriptive paper reporting the investigation carried out in Upernivik Ø in West Greenland by a Danish glaciological expedition, sent to Greenland as part of Denmark's contribution to the IGY. The main work consisted of the glaciological investigations of Sermi Kavask. The first time this glacier was visited was in the summer 1956. The glacier

was surveyed and the meteorological station was established. The next summer hydrographic observations were carried out on Sermi Kavask and in front of the glacier, and the ice margin was surveyed. In addition, Sermi Kavask as well as other glaciers in Upernivik Ø were thoroughly photographed. This paper discussed at length these investigations and their results. *Subject Headings:* **1. Glaciological observations 2. Danish participation in IGY 3. Upernivik Ø, Greenland.**—*I.S.*

12.5–176 551.583.14:551.324

Lagrula, Jean, **Explication d'une propriété de la courbe hypsographique.** [Explanation of a property of the hypsographic curve.] *Académie des Sciences, Paris, Comptes Rendus*, 249(25):2810–2811, Dec. 21, **1959.** 5 refs. **DWB, DLC**—The present statistical distribution between oceans and continents complies with an equilibrium equation set by isostasy with exchanges between continental ice and ocean water. Equilibrium is stable during melting, unstable during glaciation. The instability during glaciation is capable in certain cases of accentuating the contrast between oceans and continents, in contrast to the action of the erosion-sedimentation process; very large glaciations could even be at the origin of this contrast. *Subject Headings:* **1. Climatic changes 2. Glaciation.**—*A.V.*

F4. HYDROLOGY

See also: **Sec. on Hydromet.**, p. 976; **Dynamics of natural water streams** (Karaushev), 12.5–7; **Periodicities of annual** (Andreianov), 12.5–377.

12.5–177 551.579

Maksoud, Henry (*Centro Panamericano de Aperfeiçoamento para Pesquisas de Recursos Naturais, Rio de Janeiro*), **Definição, escôpo e aplicações da hidrologia.** [Definition, scope and applications of hydrology.] *Engenharia*, Rio de Janeiro, No. 169, Dec. **1956.** Reprint from unpaged (7 p.) fig., 10 refs. **DWB**—Analysis of water resources, the hydrologic cycle, the definition of hydrology, the relation of hydrology to other scientific and technical activities, the importance of basic hydrologic data, the collection and distribution of hydrologic data and the practical application of hydrology. The importance of the study of hydrology for engineers is emphasized by its manifold applications to economy. A schematic diagram illustrates the hydrologic cycle. *Subject Heading:* **1. Hydrology.**—*O.T.*

12.5–178 551.579:551.482.2:551.491.5

Aver'ianov, S. F., **Nekotorye voprosy podzmenogo pitaniia ravninnykh rek.** [Certain problems of the subterranean recharge of valley rivers.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy*, [3rd Conference, Oct. 1957], Vol. 9:64–71, pub. **1959.** 3 figs., 3 tables, 9 refs., 9 eqs. **DWB** (M79 V985tr), **DLC** (GB651.V83)—In view of the fact that the problem of the connection between ground water and surface river water regimes, especially their quantitative relationship, has not yet been adequately worked out, the author discusses in this theoretical paper the expediency of a joint adaptation of hydrogeologic (the theory of filtration) and hydrologic methods in solving these questions. *Subject Headings:* **1. River alimentation 2. Hydrologic regime 3. Ground water-surface flow relationships.**—*A.M.P.*

12.5–179 551.579:551.482.2:551.491.5(282.247:470)

Fedorov, L. T., **Gidrologicheskiĭ analiz gruntovogo vodoobmena rek.** [Hydrologic analysis of the water exchange between the ground and rivers.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy*, [3rd Conference, Oct. 1957], Vol. 9:71–80, pub. **1959.** 4 figs., 2 tables, 7 refs., 5 eqs. **DWB** (M79 V985tr), **DLC** (GB651.V83)—The method and results of a hydrologic analysis made on the Oka River between Kasimov and Murom on the basis of data for the period 1933–1955, are described and discussed. The detailed calculations have not only confirmed the existence of an intensive water exchange but have even made it possible to give quantitative characteristics of this exchange. *Subject Headings:* **1. Hydrologic analysis 2. River alimentation 3. Ground water-surface flow relationships 4. Oka River, Irkutsk Region, U.S.S.R.**—*A.M.P.*

12.5–180 551.579:551.491.5:551.588.6

Bogoliubov, S. N., **O podzemnom pitanii rek lesnoĭ i lesostepnoĭ zon.** [Subterranean recharge of rivers of the forest and forest steppe zones.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd,*

Trudy, [3rd Conference, Oct. 1957], Vol. 9:80–86, pub. **1959.** fig., table, 11 refs. **DWB** (M79 V985tr), **DLC** (GB651.V83)—A simple comparison of annual flow of small and large rivers shows that the relationships of these amounts often exceeds the 20–30% that contemporary hydrologic literature estimates as the subterranean recharge of rivers. *Subject Headings:* **1. River alimentation 2. Forest influences on water balance.**—*A.M.P.*

12.5–181 551.579:551.491.5

Burlaĭ, I. F., **Nekotorye voprosy teorii i metodiki gidrometrii podzemnykh vod.** [Certain problems of the theory and methods of ground water hydrometry.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy*, [3rd Conference, Oct. 1957], Vol. 9:134–141, pub. **1959.** 3 figs., 11 eqs. **DWB** (M79 V985tr), **DLC** (GB651.V83)—A theoretical paper showing that in the study of the movement (or lack of movement) of ground water it is necessary to make use of the probable statistical method as well as the genetic method. *Subject Heading:* **1. Ground water hydrology.** —*A.M.P.*

12.5–182 551.579:551.495:551.481.1

Arkhangel'skiĭ, B. N., **Priozernye depressi Severo-Zapadnogo raĭona kak ochagi drenazha podzemnykh vod.** [Depressions near lakes of the Northwest region as centers of the drainage of ground water.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy*, [3rd Conference, Oct. 1957], Vol. 9:254–259, pub. **1959.** fig. **DWB** (M79 V985tr), **DLC** (GB651.V83) -A map of a portion of the near-Baltic hydrogeological region shows schematically the piezoisohypses with .25 m distant sections which demonstrate the existence of a flow of ground water toward the near-lake depressions. *Subject Headings:* **1. Ground water hydrology 2. Drainage.**—*A.M.P.*

12.5–183 551.509.58:551.491.5

Favorin, N. N., **Formirovanie gruntovykh vod pod oroshaemyni massivami i prognoz ikh rezhima.** [Formation of ground water under irrigated areas and the forecast of its regime.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy*, [3rd Conference, Oct. 1957], Vol. 9:174–182, pub. **1959.** 4 figs., 5 eqs. **DWB** (M79 V985tr), **DLC** (GB651.V83) —The formation of ground water in irrigated areas with a slight outflow of ground water is discussed in detail. The forecast of the ground water outflow of ground water is discussed in detail The forecast of the ground water regime under such areas can be made on the basis of the water balance and the balance of ground water of the area taking into consideration a number of natural and economic conditions. *Subject Headings:* **1. Forecasting ground water regime 2. Ground water accumulation.**—*A.M.P.*

12.5–184 551.579:551.491.5

Mararenko, F. A., **Opyt izucheniia zakonomernosteĭ sviazi podzemnykh vod s poverkhnostnym stokom.** [Attempt at a study of the principles governing the relation between ground water and surface flow.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy*, [3rd Conference, Oct. 1957], Vol. 9:33–40, pub. **1959.** 26 refs. **DWB** (M79 V985tr), **DLC** (GB651.V83)—Studies of the relationship between underground and surface water were for the first time extensively developed in the 1940's at the Laboratory of Hydrological Problems of the U.S.S.R. Academy of Sciences. In this paper a summary of results of the studies is presented and explained. *Subject Headings:* **1. Ground water-surface flow relationships 2. Water table.**—*A.M.P.*

12.5–185 551.491.54:551.524.3(776/782)

Meyer, Adolph F., **Effect of temperature on ground-water levels.** *Journal of Geophysical Research*, Wash., D. C., 65(6):1747–1752, June **1960.** 3 figs., 2 tables, 3 refs. **DLC**—The results of both laboratory experiments and field investigations in Minnesota and Nebraska are presented to show the ground-water levels fall from 1 to 2 ft during the winter, with reduction in air temperature, and rise approximately the same amount in spring with increased air temperature. This condition was found to prevail in different soils during periods when there was neither evapotranspiration nor deep seepage to account for the observed change in ground water levels. In the areas studied both surface topography and ground water topography showed very flat slopes. In fact, the water table was almost level. The observations apply to areas of relatively shallow water table. Daily fluctuations of ground water levels in Nebraska due to evapotranspiration and temperature are also graphed. *Subject Headings:*

1. Water table variations 2. Temperature effects on ground water 3. Minnesota 4. Nebraska.—*Author's abstract.*

12.5–186 551.579:551.482.2:551.437

Leshchiniskiĭ, G. T., **Vremenyĭ poverkhnostnyĭ stok s takyrnykh i takyrovidnykh vodosborov i metod ego rascheta.** [Temporary surface runoff from takyr and takyr-like watersheds and a method of computing it.] *Meteorologiia i Gidrologiia*, Leningrad, No. 3:30–33, March 1960. 2 tables., 9 refs., 7 eqs. **DWB, DLC**—Accumulation of runoff in the Turkmenistan desert watersheds, composed of the takyr (clayey tracts amid sand, found especially in Turkestan) and takyr-like soils with low infiltrating property is computed with the methods described in the references. The water absorbing and infiltrating characteristics of the takyr and similar soils are considerably reduced after initial moistening. Therefore the coefficient of the runoff, used in the computing formulas, vary with intensity and duration of the rainfall. Variations of this coefficient are discussed in connection with rain intensity, soil moisture and other factors. The accuracy of computed runoff in 156 cases is discussed with numerical data. *Subject Headings:* 1. Surface runoff 2. Runoff from small watersheds 3. Runoff calculations 4. Takyr soils 5. Turkmen S.S.R.—*N.P.S.*

12.5–187 551.579:551.44(474.5)

†Silich, M. V., **Gidrografiia karsta Litovskoĭ SSR.** [Hydrography of karst in Lithuania.] *Vsesoiuznyĭ Gidgrologicheskiĭ S"ezd, Trudy*, [3rd Conference, Oct. 1957], Vol. 9:259–270, pub. 1959. 3 figs., table, 28 refs. **DWB** (M79 V985tr), **DLC** (GB651.V83)—The author, after giving some general information of the hydrography of karst in Lithuania, takes up the following topics: 1. information on the geology, geomorphology and the climate of the karst region; 2. surface water flow; 3. underground water and sources; 4. deep karst configurations; 5. chemical properties of water in the karst region and 6. practical significance of the Lithuanian karst. *Subject Headings:* 1. Karst hydrology 2. Lithuanian S.S.R.—*A.M.P.*

12.5–188 551.579:061.1(474.2)

Stirnov, A. G., **V Upravlenii gidrometeosluzhby Estonskoĭ SSR.** [The Hydrometeorological Service of Estonia.] *Meteorologiia i Gidrologiia*, Moscow, No. 9:58–59, Sept. 1959. **DWB, DLC**—During May 12–13, 1959, a conference on the hydrometeorological facilities in Estonia and on the state of hydrometeorological knowledge of the territory of the Estonian S.S.R. and adjoining seas was held. Papers were delivered by representatives of the various scientific institutions and of various economic organizations interested in meteorological information. Representatives of the fishing industry mentioned the inadequacy of hydrometeorological data and of the failure to popularize meteorological knowledge. Complaints were made of the lack of data on frozen ground, etc. *Subject Headings:* 1. Hydrologic conferences 2. Soviet hydrology 3. Estonian S.S.R.—*I.L.D.*

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION (551.501)

See also: **Homemade met. instruments** (Kolokol'nikov), 12.5–10; **Handbook of instructions for Tornado Warning Radar Trailer,** 12.5–16; **Radiosonde observation manuals** (U. S. W. B.), 12.5–17; **Manual of winds aloft obs.** (U. S. W. B.), 12.5–19; **Hist. of obs. instructions on fog** (Baliles), 12.5–45; **Transequatorial backscatter echoes** (Dueño), 12.5–70; **Sources of error in psychrometry** (Wilson), 12.5–84; **Estimating and predicting moisture of forest and gass fuels** (Wilson), 12.5–85; **Weather stations for Army use** (Goettelman et al.), 12.5–95; **Variation of heights of reflection points of meteor trails** (Weiss), 12.5–113; **Oceanog. obs. at IGY Wilkes Station** (Tressler), 12.5–155; **Scale for iceberg observations** (Nazarov), 12.5–172; **Operational features of radio theodolite** (Gröndahl), 12.5–214; **Measurement of vertical ozone distribution** (Brewer et al.), 12.5–254; **Drawing wind field charts for oceans** (Sorkina), 12.5–307; **Effect of humidity on detection of iodine in air** (Balogh), 12.5–319.

12.5–189 551.501.4:551.542

Sangster, Wayne E. (*Univ. of Chicago*), **A method of representing the horizontal pressure force without reduction of station pressures to sea level.** *Journal of Meteorology*, Boston,

17(2):166–176, April 1960. 4 figs., 6 refs., 29 eqs. **DWB, DLC**—A coordinate system is presented in which the lowest coordinate surface represents the topography of the earth. Higher coordinate surfaces reflect this topography in diminishing degrees and become isobaric at and above the 500-mb level. A method of representing the field of the horizontal pressure force in the nonisobaric coordinate surfaces, using geostrophic stream and potential functions, is described. Geostrophic winds computed from these functions are compared with those obtained from the customary sea-level charts and with observed winds. *Subject Headings:* **1. Pressure measurement techniques 2. Horizontal pressure force 3. Topographic effects 4. Geostrophic wind computations.**—*Author's abstract.*

12.5–190 551.501.42:681.14

Brown, Robert M. (*Brookhaven Natl. Lab., Upton, Long Island, N. Y.*), **An automatic meteorological data collecting system.** *Journal of Geophysical Research*, Wash., D. C., 64(12):2369–2372, Dec. 1959. 4 figs., 6 refs. **DLC**—In common with other research and industrial organizations forced with the problems of reducing large volumes of data, the Brookhaven Meteorology Group and Instrumentation Division have developed an automatic data collecting system. This device is capable of accepting meteorological information in the form of either a rotation or a voltage. It then converts these inputs to digital information and records them on a paper punch. The tape punch is extremely fast and it is possible to scan the required information every 0.6 second. This eliminates the need for developing mean data prior to the coding. *Subject Headings:* **1. Data collection services 2. Automatic data collection.**—*Author's abstract.*

12.5–191 551.501.7:551.571.73:551.524.73 551.551.5:551.557.5

Helliwell, N. C., **Airborne measurements of the latitudinal variation of frost-point, temperature and wind.** *Great Britain. Meteorological Office, Scientific Paper*, No. 1, 1960. 30 p. 10 figs., 3 tables, 9 refs. **DWB**—The results of six flights in July and Aug. 1956 and three flights in March 1957 between 40°N and 68°N are presented together with diagrams showing the variation of frost point, temperature and wind. Little latitudinal variation of frost point at 46,000 ft (140 millibars) was found, and generally frost points in the lower stratosphere showed little variation except in the region of upper fronts or jet streams. Some of the flights showed evidence of frontal zones in the lower stratosphere. Some aspects of the clear air turbulence associated with jet streams are discussed and the location of turbulence with respect to the jet stream maximum and the tropopause is presented in a diagram using the data obtained on these flights. *Subject Headings:* **1. Air-borne humidity measurements 2. Frost point measurements 3. Latitudinal variations in humidity 4. Stratospheric humidity measurements.**—*Author's abstract.*

12.5–192 551.501.7:535.33:551.510.534

Yamasaki, M. and Akita, T. (*both, Aerological Obs.*), **Observation of the vertical distribution of ozone by airborne spectrographs, Pt. 4.** *Tateno, Japan. Aerological Observatory, Journal*, 6(4):205–207, Jan. 1960. fig. English and Japanese summaries p. 205. **DLC**—In Aug. 1959, direct observations of the vertical distribution of ozone over Tateno were made. The instrument and the method of observations and evaluation were almost the same as previously reported in the back numbers of this journal. As shown in Fig. 1, there existed the maximum concentration of ozone in the layer of 22–26 km in each ascent, but its amount of Aug. 3 was about a half of Aug. 19 or 28, and the concentration below 20 km was larger on 3 than the other two days. *Subject Headings:* **1. Ozone distribution 2. Vertical distribution of ozone 3. Air-borne spectrograph observation of ozone 4. Tateno, Japan.**—*Authors' abstract.*

12.5–193 551.501.75:551.507.321.2

Killen, Gwendolyn L., **Balloon behavior experiments.** *U. S. Signal Research and Development Lab., Ft. Monmouth, N. J., Technical Report*, 2093, Jan. 15, 1960. 30 p. 20 figs., 11 eqs. **DWB** (M(055) U582us)—A study was made of the balloon as a device for wind measurement. Experiments were conducted in which the trajectories of meteorological balloons were tracked when released in still air inside a closed building. It was found that the balloons developed

aerodynamic lift forces which caused them to develop considerable horizontal components of velocity and that these velocities varied with the amount and location of ballast below the balloon. *Subject Heading:* **1. Balloon experiments.**—*Author's abstract.*

12.5–194 551.501.75:551.551:551.554

Martin, Frank L. (*U. S. Naval Postgraduate School, Monterey, Calif.*), **A new method of computing the Deacon wind profile parameters.** *Journal of Geophysical Research*, Wash., D. C., 65(2):623–628, Feb. **1960.** 3 figs., 10 refs., 20 eqs. Also: [**Discussion**] **by W. P. Elliott and** [**Reply**] **by Martin,** *Ibid.*, 65(8):2558–2560, Aug. **1960. DLC** —An explicit formula for the local Deacon profile parameter β is derived. This formula involves surface roughness, local Richardson number, and adiabatic friction velocity, as well as the wind shear and elevation. The development is based on the surface layer theories of LETTAU as well as on the derivative form of the Deacon profile. Local values of β fluctuated considerably with height, but weighted mean values in the vertical gave reasonably good correlation with the weighted mean value of $(1+x)^2$ in the layer, where x is essentially the Richardson number. *Subject Headings:* **1. Deacon wind profile parameters 2. Wind profile parameters.**—*Author's abstract.*

12.5–195 551.501.776:551.576.2

Müller, Walter (*Vienna*), **Methoden zur Abschätzung der Anteile bestimmter Bewölkungsstufen aus den drei Klimaterminen.** [Methods for estimating the frequencies of specified cloud amounts on the basis of three standard observations.] *Wetter und Leben*, Vienna, 12(3/4):72–76, **1960.** 5 tables, 4 refs. German and English summaries p. 72. **DLC** —For many purposes in climatology, it is necessary to know the monthly frequency distributions of the cloud amount. Therefore, using a five-year period of data from Zurich Airport some practical methods are discussed here which permit the calculation of the actual hourly frequency distribution of the total sky cover even if only climatic observations are available. *Subject Headings:* **1. Cloud amount 2. Cloudiness regime 3. Cloud observation.**—*Author's abstract.*

12.5–196 551.501.81:551.557

*Barbé, Georges Dominique and Ervet, Pierre Paul, **Données numériques sur la circulation atmosphérique en altitude, jusqu'à 30 km et au delà, en été, en bordure ouest des Alpes françaises, près de Chambéry.** [Numerical data on atmospheric circulation up to a height of 30 km and above obtained during the summer at the western border of the French Alps near Chambéry.] *Germany. Deutscher Wetterdienst, Berichte*, 8(54):184–189, **1959.** 4 figs., 2 tables, ref. French, German and English summaries p. 184. **DWB, DLC**—The measuring instrument is a radar with a wave length of 10 cm, which automatically tracks a balloon and a passive target from the type of a trirectangular trihedron. Almost 200 soundings were made in July 1957 at the Bourget-du-Lac airfield, near Chambéry. Sixty among these soundings reached a height of more than 25 km and 23 successive soundings within 24 hours on July 8 and 9. The "double sounding" method was developed and applied to 17 soundings: two entirely independent soundings are made simultaneously with two balloons launched at nine-minute intervals. Position is measured alternately each minute. Results: 1) the slight influence of atmospheric turbulence, in proportion to the measurements, was particularly noteworthy; 2) above a height of 18 to 22 km, easterly winds were measured each day. 38 soundings reached heights of 30 km or more. *Subject Headings:* **1. Radar balloon tracking 2. Radar observation of upper air winds 3. Upper air wind soundings 4. French Alps 5. Chambéry, France.**—*Authors' abstract.*

12.5–197 551.501.81:551.578.7

*Donaldson, Ralph J., Jr.; Chmela, Albert C. (*both, Cambridge Res. Cen., Bedford, Mass.*) and Shackford, Charles Reeve (*Allied Res. Associates, Inc., Boston*), **Some behavior patterns of New England hailstorms.** *American Geophysical Union, Geophysical Monograph*, No. 5:354–368, **1960.** 21 figs., 5 tables, 12 refs. **DWB, DLC**—Radar measurements of New England thunderstorms have been combined with reports furnished by cooperative observers during three years. Echo tops in storms releasing hail of less than $\frac{3}{4}$ in. diameter were higher, colder, and penetrated the tropopause more often than tops of rain thunderstorms. The

differences are even more striking for storms with large hail ($\frac{3}{4}$ in. or larger) compared with the other two categories. Extreme tropopause penetrations of 10,000 to 15,000 ft occurred on five days, of which all but one were tornado days. A study was made of the histories of 20 hailstorms. Ten of them dropped hail for long periods of time (hail repeaters), the others for less than 20 min and at only one or two locations. All cases of severe damaging winds and tornadoes occurred with the hail repeaters. Within a wide scatter, both echo tops and maximum intensities in the hail repeaters attained higher peaks and remained high for longer periods of time than in the single hail producers. Hail locations in all storms exhibited a slight tendency to appear in the right, rear quadrant of the storm, with the larger hail sizes located to the right of the smaller hail, facing downstream. Echo areas of various intensities as a function of height were measured in two hailstorms, one just getting under way and the other a well-developed producer of several tornadoes. Computations are made of hail-mass concentration versus height at various times in the two storms, assuming the radar echo is scattered from 1-cm ice spheres. Mean 1-cm hail concentrations in the tornado storm, averaged over the total echo area at the height of the most intense echo, varied from 0.3 to 1.3 g/m^3, but the maximum concentrations in the echo core ranged from 9 to 170 g/m^3, subject to a possible over estimate by a factor of 5 due to an unresolved radar calibration error. During two observations of echo tops penetrating the tropopause, the echo volume above the tropopause increased rapidly with time, suggesting a progressive modification of the lower stratosphere above the storm. Hailstone information furnished by cooperative observers is summarized. Median values are: max diameter, 7 mm; max/min size ratio in a hailfall, 2; number concentration, 0.1/m^3; hailfall duration, 3–4 min; hailfall started four min after heavy rain began. About 75% of hail shapes were divided between spheres and oblates. *Subject Headings:* **1. Hailstorms 2. Hailstorm radar echoes 3. Tornadoes 4. Thunderstorm echo top (height and temperature) 5. Hailstorm histories 6. Hail size frequency distribution 7. New England.**—*Authors' abstract.*

OBSERVATIONAL DATA (551.506)

See also: **Training guide in pilot balloon obs.** (U. S. W. B.), 12.5–15; **Code for transmission of weather and sea obs.,** 12.5–18; **Swiss Polar Exped. to Murchison Bay** (Lugeon), 12.5–21; **Upper air temp. data, Central Arctic Basin** (Belmont), 12.5–26; **Arctic weather studies** (Reed, Surface), 12.5–27; **Radiation balance, Scott Base** (Thompson, Macdonald), 12.5–32; **Ice obs., Antarctica** (Tomashunas), 12.5–35; **Ice around Showa Base** (Ono), 12.5–36; **Weather Central, Little America** (Moreland), 12.5–37; **Phenological Service, Germany** (Witterstein), 12.5–38; **Technical parameters of satellites** (Clarke), 12.5–55; **Met. and oceanog. obs. on I.N.S. Investigator** (Das, Dhar), 12.5–151; **Vertical cross section of the atmos., Indian Ocean** (Usmanov), 12.5–272; **Micromet. obs. over non-ideal surfaces** (Franceschini), 12.5–379.

12.5–198 551.506.3:551.578.46(494)

Mercanton, P. L., **Un demi-siècle d'observations aux nivomètres de l'Eiger et des Diablerets.** [A half century of observations by the nivometers at Eiger and at Diablerets.] *Schweizerische Naturforschende Gesellschaft, Geneva, Verhandlungen,* 137, 67–68, **1957. DLC** (Q67.S4)—A summary of observations made at Eiger since 1906 and at Diablerets since 190[illegible] are presented. They include the scale of mean, maximum and minimum extension as well as mean annual maximum of snow cover with dates, and the fifty-year balance of 6.5 m snow accumulation. The known frontal variations of the inferior glacier of Grindelwald, for possible correlation, are given for the same half century. *Subject Headings:* **1. Snow cover data 2. Glacier variations 3. Diablerets, Switzerland 4. Eiger, Switzerland 5. Grindelwald, Switzerland.**—*O.T.*

12.5–199 551.506.7:551.508.822(213)

†*Berruex, M. (*Met. Service of Belgian Congo*), **Contribution à la connaissance de l'atmosphère équatoriale: une année de radiosondages a Léopoldville.** [Contribution to the knowledge of the equatorial atmosphere: one year of radiosondes at Léopoldville.] *Académie Royale des Sciences Coloniales. Classe des Sciences Techniques, Mémoires* in 4°, 5(5), **1958.** 78 p., 28 figs., 13 tables, 15 refs. **DLC**—The results of radiosonde observations for the year May 1954 to April 1955 are presented. They deal with the method of work; general aspect o[illegible]

sounding; monthly and annual means, amplitude; standard levels, isotherm 0°C; tropopause and stratosphere; variance, quadratic divergence, frequency of occurrence, isopleths and the mean atmosphere at Léopoldville. The various tables and figures comprise an abundant part of the work. A bibliography is included. *Subject Headings:* **1. Equatorial atmosphere 2. Radiosonde observations 3. Léopoldville, Belgian Congo.**—*O.T.*

12.5–200 551.506.7:551.508.822(71)

*Canada. Meteorological Branch, **Monthly Bulletin Canadian Radiosonde Data, Jan. 1959.** Monthly. about 60 p. each. entirely tables. Price from Queen's Printer, Ottawa, Annual, $6.00.—The tables presenting the daily observations of the stations indicated on a map contain altitude, temperature, wind for surface 1000, 850, 700, 500, 400, 300, 200, 150, 100, 80, 50, 30, 25, 20 and 10 mb, as a summary of constant pressure data. A second series of tables contain surface synoptic data, freezing levels, tropopause and maximum wind levels as special aerological data. *Subject Headings:* **1. Monthly meteorological data bulletin 2. Synoptic data 3. Upper air data bulletins 4. Canada.**—*O.T.*

12.5–201 551.506.7(624)

*Great Britian. Meteorological Office, **Upper air data for stations maintained by the Meteorological Office: summaries of radio-sonde observations of temperature and humidity and of radar wind measurements at standard pressure levels, 1953–1955, Pt. 4, Khartoum.** 5 p. 3 plates, 5 tables, 14 refs. Its *M.O.* 628. **DWB** (M06.7 G786u)—Standard upper air temp., wind, humidity and height tabulations and tropopause data for Khartoum (15°N, 32°E), Sudan for 1953–5 data are presented in both tabular and graphical form and are extensively annotated. *Subject Headings:* **1. Upper air data summaries, Khartoum 2. Tropopause data summaries, Khartoum 3. Khartoum, Sudan.**—*M.R.*

12.5–202 551.506.8:551.584.3

*Simonis, R., **Modifizierung phänologischer Daten durch lokalklimatische Sonderverhältnisse.** [Modification of phenological data by particular local climatic conditions.] *Angewandte Meteorologie*, Berlin, 3(11):339–345, May **1960.** 5 figs., 5 tables, 10 refs. German and English summaries p. 339. **DLC**—An example of predominantly low and partly wild-living plants, is given to demonstrate the extent to which meteorological radiation modifies the beginning of vegetation phases, which is dependent on shading, the relative position of clearing borders and on slope inclination. Furthermore, a number of cases drawn from an abundant phenological-phenometric observational material, of habitats of the same kind of plants differing merely by their respective hill-side exposition, are discussed. *Subject Headings:* **1. Phenological data 2. Plant microclimatology.**—*Author's summary.*

INSTRUMENT CARRIERS (551.507)

See also: **Training guide in pilot balloon observations** (U. S. W. B.), 12.5–15; **Acoustical soundings of warm layer during IGY** (Facy), 12.5–23; **Arctic weather studies** (Reed, Surface), 12.5–27; **Proceedings of 7th and 8th Int. Astronautical Congresses,** 12.5–43; **Auroral obs. made in ships** (McInnes), 12.5–130; **Balloon experiments** (Killen), 12.5–193; **Soil thermometers** (Henning), 12.5–211.

12.5–203 551.507.3:551.508.822:551.557

Angell, J. K. (*U. S. W. B.*), **Estimating the frictional force at 300 mb by means of transosonde and radiosonde data.** *Journal of Meteorology*, Boston, 16(2):216–217, April **1959.** table, 2 refs., 3 eqs. **DWB, DLC**—With minor approximation the equation of motion in the horizontal plane can be: $dV/dt+w\partial V/\partial z=f(V-V_0)\times k+F$ (where dV/dt=acceleration of an air parcel constrained to remain on a constant level surface, w=vertical motion, $\partial V/\partial z$=wind shear in the vertical, f=Coriolis parameter, k=unit vector in the vertical and F=friction force per unit man). Hence if a good estimate of the geostrophic wind can be obtained from radiosonde data and reasonable estimates of the vertical velocity and wind shear in the vertical can be obtained from a combination of transosonde and radiosonde data then the equation of motion for the friction force can be solved by utilizing the values of velocity and acceleration obtained from radiosonde data. The determination of the various parameters using appro-

priate equations is described and average absolute values of velocity and acceleration parameters are presented and the average sum of those parameters is considered. *Subject Headings:* **1. Geostrophic wind computation 2. Radiosonde data 3. Transosonde data 4. Equations of motion.** —*I.L.D.*

12.5–204 551.507.351:551.524

Garcia, R. (*Météorologie Nationale, Paris*), **Mesure des températures dans les très basses couches à Charcot.** [Low level temperature measurements at Charcot.] *La Météorologie*, Paris, Ser. 4, No. 57:213–218, Jan./March 1960. 4 figs., 2 tables. French, English, Spanish and Russian summaries p. 213. **DWB** —This article describes the results of an experiment by means of kites at Charcot Station, Antarctica, for low level temperature measurements. It describes the equipment used and the technique employed in the experiment. On the basis of the difficulties encountered, the author emphasizes the disadvantages of this technique and suggests their solution. The observations made during ten soundings and the meteorological conditions at the time of these soundings are given in tables. *Subject Headings:* **1. Kite soundings 2. Low level temperature data 3. Charcot Station, Antarctica.**—*A.V.*

12.5–205 551.507.352:551.508.91 551.574.11:546.13

†Podzimek, Josef (*Czechosl. Acad. Sci., Hradec Králové*), **Measurement of the concentration of large and giant chloride condensation nuclei during flight.** *Studia Geophysica et Geodaetica*, Prague, 3(3):256–280, 1959. 14 figs., 3 tables, 39 refs., 9 eqs. Russian summary p. 280. **DWB**—The use of sensitive gelatine layers for determining the concentration of giant chloride condensation nuclei as representated by the method of Vittori, the taking of atmospheric samples during airplane flights and the results of measurements of condensation nuclei on the atmosphere are discussed. The analysis of diffusion processes in the gelatine and the study of different influences on Liesegang rings show that samples can be taken in the atmosphere. The influences of the differences in temperature and humidity during normal atmospheric conditions can be neglected. A magnification of 480 times suffices for studying the images of large and giant nuclei. The magnification factor is determined by evaluating the spectrum of sedimenting particles. The factor varies slightly with the concentration of the solution from which nuclei forms and has a mean value of 6. Atmospheric temperature and humidity do not influence the size of the image in any particular way. The method of taking samples from an airplane is described and the results of 7 ascents are presented in tables and graphs. The measured concentration of large and giant particles was found not to be sufficient to explain the effective coagulation process which produces precipitation from a water cloud. The distribution of condensation nuclei supports the hypothesis of a double origin of chloride particles inland. At higher levels the particles are of oceanic origin which is controlled chiefly by height flow and the general synoptic situation. Up to a few hundred meters above the ground, large and giant nuclei are found, but their concentration depends upon orographic conditions and temperature stratification. The results of measurements on chloride condensation nuclei are presented in tables. *Subject Headings:* **1. Condensation nuclei 2. Chloride nuclei 3. Airplane sampling of nuclei.**—*I.L.D.*

INSTRUMENTS (551.508)

See also: **Radiosonde observation manuals** (U. S. W. B.), 12.5–17; **Slant visibility measuring system,** 12.5–50; **Lyman α experiment for Vanguard satellite** (Chubb et al.), 12.5–62; **Vertical recovery of sci. instruments** (Patterson), 12.5–64; **Neutron moisture meter** (Marais, Smit), 12.5–73; **Sources of error in psychrometry** (Wilson), 12.5–84; **Weather stations for army use** (Goettelman et al.), 12.5–95; **Optical instrumentation for missile testing** (Soc. of Motion Picture & Television Engrs.), 12.5–97; **Ionizing radiation at altitudes of 3,500–36,000 Pioneer I** (Rosen et al.), 12.5–120; **Thermistor thermometer for estuarine investigation** (Srivastava, Ramam), 12.5–154; **Radiosonde obs., Léopoldville** (Berruex), 12.5–199; **Monthly bulletin of radiosonde data, Canada,** 12.5–200; **Estimating frictional force by transosonde and radiosonde data** (Angell), 12.5–203; **Measurement of condensation nuclei during flight** (Podzimek), 12.5–205; **Cooling power and thermal radiation, Baltic Sea coast** (Grimm), 12.5–392.

12.5–206 551.508.21:551.508.23

Galindo Estrada, I. G. and Fournier d'Albe, E. M., **The use of the Campbell-Stokes sunshine recorder as an integrating actinometer.** *Royal Meteorological Society, Quarterly*

Journal, 86(368):270–272, April **1960.** 2 figs. **DWB, DLC**—A simple method is described to evaluate the daily total direct solar radiation, by measuring the weight of paper burnt in the Campbell-Stokes sunshine recorder. *Subject Heading:* **1. Solar radiation measurement instruments.**—*Authors' abstract.*

12.5–207 551.508.21

Skachkova, I. F., **Ustnaovka dlia aktonometricheskikh izmereniĭ.** [Apparatus for actinometric measurements.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 83:36–39, **1958.** fig., ref. **DWB, DLC**—In order to ensure accuracy and similarity in the performance of actinometric measurements, now being made at all meteorological stations and in view of the fact that the standard actinometric equipment is not supplied with accessories by the manufacturers, each station has to provide its own sockets, which are often of inferior quality, the main Geophysical Observatory has developed an apparatus with which all standard actinometric equipment i.e., the thermoelectric AT-50 actinometer, the pyranometer, the thermoelectric balance meter and galvanometer GSA-1, are securely mounted and operated with accuracy. The design of this apparatus is described and explained in detail by the author. *Subject Heading:* **1. Actinometric equipment.**—*A.M.P.*

12.5–208 551.508.23

Dirmhirn, Inge (*Zentralanst. f. Met. & Geodyn. Vienna*), **Untersuchungen an Sternpyranometern.** [Investigations with stellar pyranometers.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 9(2):124–148, **1958.** 12 figs. (incl. photos), 2 tables, 20 refs., eq. German, English and French summaries p. 124–125. **DWB, DLC**—Development, construction and operation of star pyranometers used in Austria are discussed. The three usual models have been tested by rigorous experiments as to whether certain requirements for a correct functioning are fulfilled. It is shown that the short-wave radiation of the atmosphere in the spectral range between 0.3 and 3μ is nearly independent on the wavelength and that it can be measured, in accordance with the cosine law, precisely up to angles of incidence of 75° and better than by other pyranometers with angles greater than 75°. Temperature influence on the indication of the instrument can be eliminated by choosing the right combination: receiver, circuit, pyranometer. The position of the instrument, long-wave temperature radiation, and weather conditions do not influence the indication. The time of reaction is 20 seconds. After obturation, the pointer returns exactly to zero. There is a strict proportionality between the amount of current and the radiation intensity. Different instruments are well comparable among each other. The study shows that the accuracy of measurement of the described star pyranometers is sufficiently high and that these instruments offer correct results in case of momentaneous measurements of the global radiation, of the sky radiation, and of the albedo, as well as in case of continuous recording. *Subject Heading:* **1. Stellar pyranometers.** —*Author's abstract.*

12.5–209 551.508.25:551.521:551.577

Frankenberger, Ernst (*Hamburg*), **Über die Anwendung von Strahlungsbilanzmessern verschiedener Bauart bei Wärmehaushaltsuntersuchungern.** [Use of radiation balance meters of different types for heat economy investigations.] *Annalen der Meteorologie*, Hamburg, 8(5/6):163–166, **1958.** 5 figs., 3 refs. **DWB, DLC**—The efficiency and accuracy of the radiation balance meters of ALBRECHT-WAGNER and of SCHULTZE are compared. In the case of the ALBRECHT-WAGNER balance meter rain wetting the upper side of the measuring element produces a cooling which simulates a negative radiation balance. On the one hand, in the case of rain, the recording of the SCHULTZE balance meter is falsified slightly, since during rain the underside of the cloud is usually low and thereby the difference between the long wave radiation of the ground and the atmospheric counter radiation is slight and because the short wave radiation can penetrate freely the water film of the balance meter. On the other hand, it was found that at times the radiation balance Q or the difference between Q and B (soil heat flux) takes on positive values while the vertical temperature gradient and the vertical moisture gradient showed that the soil surface was receiving heat by conduction. In such cases the ALBRECHT-WAGNER heat radiation balance meter gives better results. The reason for this is that this balance meter maintains the upper and under surfaces of the measuring element at the same temperature so that either dew or rime formations are the same on both sides. The

SCHULTZE radiation balance meter can no longer respond to the long wave radiation flux whic is absorbed by the water film of the cap. By ventilating the cap the instances with dew forma tion are restricted considerably. A description of the ventilation arrangement is described wit the aid of a diagram. A comparison between a ventilated and an unventilated radiatic balance meter shows that before 8 a.m. only 30% of a very intense effective radiation is recorde by an unventilated radiation balance meter. After the unventilated balance meter is cleanc it shows higher positive values than the ventilated instrument. Further comparison of detaile hourly measurements of balance totals with a ventilated and unventilated instrument for December decade (1957) shows that the difference is slight amounting to only 9 cal/cm² but important since it is 18% of the total December decadal amount. *Subject Headings:* **1. Radia tion balance meters 2. Radiation balance meter errors 3. Radiation balance meter ventila tion 4. Rain effects on radiation balance meters.**—*I.L.D.*

12.5–210 551.543:551.508.29:536.53:551.58

Karoli, A. R. (*Eppley Foundation for Research, Inc., Newport, R. I.*); Ångström, A. F and Drummond, A. J. (*both, Eppley Lav., Inc., Newport, R. I.*), **Dependence on atmospher pressure of the response characteristics of thermopile radiant energy detectors.** *Optic Society of America, Journal*, 50(8):758–764, Aug. **1960.** 5 figs., 3 tables, 12 foot-refs., 5 eq **DWB, DLC**—An account is given of an investigation into the pressure dependence of the sens tivity (i.e., responsivity) of 10 different types of thermopile detector over the pressure rang 760–10^{-6} mm. The study is confined to those forms of thermopile commonly used for th measurement of unmodulated solar and infrared radiation. The radiation intensity-thermopi *emf* relationship at reduced ambient pressures is discussed, as is also the change introduce into the response-time constant. It is demonstrated that the results for the different instr ments are in agreement, generally, with what is derived from the fundamental laws governin energy transfer within radiometric devices. *Subject Headings:* **1. Thermopile radiant energ detectors 2. Radiometric instruments 3. Pressure effects on thermopile detectors.** *Authors' abstract.*

12.5–211 551.508.29:551.525:551.507

Henning, H., **Eine Halterung für Erdbodenthermometer von 0–300 mm Einbaulängе** [New support for soil thermometers with an insertion length of 0–300 mm.] *Zeitschrift f Meteorologie*, 13(7/8):195–196, July/Aug. **1959.** 4 figs., 3 refs. **DWB, DLC**—Improvemen in soil thermometers, based on experiments as well as on consideration of material and technic devices, made at the Haupsamt für Klimatologie, Potsdam, are described and illustrate *Subject Heading:* **1. Soil thermometers.**—*O.T.*

12.5–212 551.508.29:536.532 551.5

Lützke, R., **Erfahrungen mit einer transportablen thermoelektrischen Registrierapparat bei kleinklimatischen Untersuchunger.** [Experiences with a portable thermoelectric recordi apparatus in microclimatic research.] *Angewandte Meteorologie*, Berlin, 3(11):325–333, Ma **1960.** 6 figs., 11 refs., 2 eqs. German and English summaries p. 325. **DLC**—Necessary ste are described as to how six-fold recorders, connected in series to photocell amplifiers, can made to work at a high degree of accuracy when employed in mobile out-of-door operatic The author makes remarks on possible errors due to secondary thermoelectric forces wh temperatures are measured by fine-wire thermocouples. *Subject Headings:* **1. Microclima research 2. Thermoelectric recording apparatus 3. Thermoelectric measurement technique** —*Author's abstract.*

12.5–213 551.508.41 531.7

†Bromacher, W. G.; Johnson, D. P. and Cross, J. L., **Mercury barometers a manometers.** *U. S. National Bureau of Standards, Monograph*, No. 8, May 20, **1960.** 59 5 figs., 12 tables, bibliog. p. 45–46, 79 eqs. **DWB** (M08.43 B868me)—The various designs mercury barometers and manometers are briefly described, with a more extended discussion

the various design elements which may affect the achievable accuracy. Sources of error in measuring pressures are described in considerable detail, particularly for portable instruments, including scale, temperature, gravity, capillarity, vacuum errors and return gas column. Methods of minimizing those errors and of making the corrections, including extensive tables, are presented. Standard conditions are defined and the pertinent properties of mercury given. The paper contains 65 literature references. *Subject Headings:* **1. Mercury barometers 2. Manometers 3. Pressure measuring devices.**—*Authors' abstract.*

12.5–214 551.508.57:551.501.75

Gröndahl, Erkki (*Väisälä Oy., Radiosonde Technician*), **Some operational features of the radiotheodolite.** *Vaisala News*, Helsinki, No. 4:7–8, Dec. 1959.—The wind data of upper air radiowind observations are calculated at the Väisälä Station with the radiotheodolite according to a new computation method which permits the pilot report to be ready in a few minutes after the balloon burst. To do the recording and computing only one radiowind operator is needed. The present paper discusses the details of the sounding procedure. *Subject Headings:* **1. Radio theodolite operation 2. Upper air radiowind observation techniques 3. Väisälä Station, Helsinki.**—*I.S.*

12.5–215 551.508.77:551.501.777(481)

Hesselberg, Th., **Some investigations on the method of measurement of precipitation.** *Meteorologiske Annaler*, Oslo, 4(16):431–440, 1959. 5 tables. **DLC**—In 1906–07, comparative measurements were made at a selection of stations with raingages with and without a Niphers shield. At all but one of the stations, Fredriksberg, the use of a shield resulted in increased precipitation amounts. Further measurements were made at Fredriksberg in 1908–17, 1945–46, and at Sor Nessett, 1953–57; both locations have an appreciable slope in the terrain. The gages were placed, with and without shields, on a vertical post; on a post perpendicular to the (sloping) ground and below ground level, the orifice flush with the ground. The gages on a vertical post gave too small catches, the deficit varying with wind direction. Gages with a shield gave even smaller catches if the air current had a rising component because of the slope of the ground, while the inverse was true for wind flowing downward. The gage with orifice at ground level was considered to give absolute measurements of rainfall, but was unreliable for snowfall, as drifting snow from the surrounding ground influenced the measurements. The principal result of the investigations was that a gage with a shield gives approximately correct catches when placed on a post perpendicular to the ground. *Subject Headings:* **1. Precipitation measurement techniques 2. Precipitation measurement instruments.**—*R. S. Quiroz.*

12.5–216 551.508.822:551.571.7

*Hinkel, C. H. and Tucker, G. B., **A comparison of radiosonde and Meteorological Research Flight humidity measurements.** *Meteorological Magazine*, London, 87(1037):333–338, Nov. 1958. 6 figs., 2 tables, 6 refs. **DWB, DLC**—Comparison of humidity measurements made by radiosonde (goldbeater's skin element), and on the Meteorological Research Flight (MRF) aircraft (frost point hygrometer) leads to the conclusion that the errors are of opposite sign: the radiosonde soundings giving an over-estimation of the humidity by 15–35%, and the frost point hygrometer giving much smaller errors (nearer the true humidity values). Reasons given are: lag-errors are less in the MRF flights as the plane is traveling at 200 knots or more, whereas the radiosonde is ascending very slowly. Differences in humidity elements, in methods of computation and procedures are set forth. Data for southern England obtained from 303 observations during each of four seasons and the year, for both types, are compared for 500 mb (and 180 observations for 700 mb) for 1946–50 (4 observations a day) and the data compared on scattergrams. *Subject Headings:* **1. Upper air humidity accuracy 2. Goldbeater's skin hygrometers 3. Frost point hygrometers 4. Meteorological Research Flight soundings 5. Southern England.**—*M.R.*

SYNOPTIC ANALYSIS AND FORECASTING (551.509)

See also: **Handbook of instructions for Tornado Warning Radar Trailer,** 12.5–16; **Code for transmission of weather and sea obs.,** 12.5–18; **Weather Central, Little America** (Moreland), 12.5–37; **Use of facsimile in a met. service** (Weber), 12.5–40; **High level flight conditions** (Kogan-Beletskiĭ), 12.5–51; **Ceiling and visibility forecasting** (Munn), 12.5–52; **Effects of adjusting night temp. on greenhouse roses** (Boodley, Seeley), 12.5–74; **Frost protection** (Peyer), 12.5–75; **Met. aspects of desert locust control** (Kraus), 12.5–78; **Midsummer diurnal winds in S. Australia** (Clarke), 12.5–86; **Long range oceanog. forecasts** (Takenouti), 12.5–160; **Forecast of water temp. south of Hokkaida** (Sugiura), 12.5–161; **Wave forecasting methods** (Pierson), 12.5–162; **Short range ice forecasting** (Wittmann), 12.5–168; **Sea ice obs. and drift ice movement prediction** (Kurasina), 12.5–169; **Drift-ice movement prediction** (Kurasina), 12.5–169; **Sea ice reconnaissance and forecasting program during Arctic operations** (Tait), 12.5–170; **Formation of ground water . . . and forecast of its regime** (Favorin), 12.5–183; **Geostrophic approximation related to the scale effect of atmos. disturbances** (Gambo), 12.5–262; **Synoptic study of formation of typhoons** (Matano), 12.5–279; **Forecast of water temp. east of Tohoku, summer 1957** (Hakodate Marine Observatory), 12.5–298; **Pressure characteristics and change** (Shinners), 12.5–299; **Evap. from water surfaces, Stockholm** (Hellström, Jansen), 12.5–323; **Mesoanalysis** (Bleeker), 12.5–382.

12.5–217 551.509.312:518.1

Hübner, Christiane and Wippermann, Fritz, **Tests der Konvergenzgeschwindigkeit eines dreidimensionalen Relaxationsverfahrens zur Ermittlung des Feldes der Vertikalgeschwindigkeit in der Atmosphäre.** [Tests of the convergence velocity of a three dimensional relaxation method to determine the vertical velocity field of the atmosphere.] *Beiträge zur Physik der Atmosphäre,* Frankfurt a.M., 32(3/4):195–201, **1960.** 2 tables, 24 eqs. German, English and French summaries p. 195. **DWB, DLC**—The determination of the vertical velocity field of the atmosphere requires the integration of an (elliptic) partial differential equation of a 2nd order with variable coefficients. To perform a numerical integration, iteration procedure is outlined and tried on a mesh with 11,236 interior points; in doing this the convergence is investigated in its dependence on the actual meteorological conditions and on the number of iteration steps in horizontal and vertical direction. For the latter different magnitudes can be chosen. *Subject Headings:* **1. Numerical forecasting 2. Relaxation methods.**—*Authors' summary.*

12.5–218 551.509.317:551.515.827:551.557.1

*Pogosian, Kh. P., **Planetarnye frontal'nye zony v severnom i iuzhnom polushariiakh** [Planetary frontal zones in the Northern and Southern Hemispheres.] Leningrad, Gidrometeoizdat, **1955.** 57 p. 21 figs., 17 tables, 15 refs. **DLC** (QC878.P56)—A pamphlet for specialists (700 copies), giving data and original mean seasonal charts for the world of the absolute topography of the 500 mb surface and the thickness from 500 to 1000 mb together with charts of the planetary upper frontal zone (about 40°N and S) and the temperature and wind fields produced in the two hemispheres (N. and S.) by the continent-ocean distribution charts of anomalies, meridian transport of air mass, differences between seasons, etc. Each of these subjects is discussed after a short historical sketch on the author's work during the past 15 years along these lines. *Subject Headings:* **1. Mean 500 mb charts of world 2. Planetary upper frontal zones.**—*M.R.*

12.5–219 551.509.317:551.547.5

Teweles, S.; Rothenberg, L. and Finger, F. G. (*all, U. S. W. B., Wash., D. C.*), **The circulation at the 10-millibar constant pressure surface over North America and adjacent ocean areas, July 1957 through June 1958.** *Monthly Weather Review,* Wash., D. C., 88(4):137–150 April **1960.** 12 figs., table, 23 refs. **DWB, DLC**—A recently published set of 10-mb charts analyzed three times monthly, July 1957 through June 1958, is used as a basis for discussion of the high stratospheric circulation during the first 12 months of the IGY. There is a slow steady transition from summer easterlies to winter westerlies which appear first in high latitudes and then strengthen and expand southward. In January and February 1958, the circulation breaks down rapidly and in a highly complex manner. By May polar easterlies become established and spread southward to merge the intensifying subtropical easterlies. Several

related topics on the nature of medium and large scale developments are discussed. *Subject Headings:* **1. 10 mb constant pressure surface 2. Stratospheric circulation 3. North America.** —*Authors' abstract.*

12.5–220 551.509.318:551.575.1(425.3)

Bradbury, T. A. M., **Rapid spread of Lincolnshire fog during a February afternoon.** *Meteorological Magazine*, London, 89(1053):98–101, April **1960.** 3 figs. **DWB, DLC**—On Feb. 17, 1959, there was an unusual spread of fog just after the period of maximum insolation. On Feb. 17, an anticyclone was noticed over Belgium and by mid-morning, the fog reached the Lincolnshire area of England. The temperature rose to 50°F in Lincolnshire. At first the rise in temperature suggested that the fog would be slow to return in evening, but it returned within half an hour. The cold surface air advanced at a speed of ten to twelve knots. At Hemswell the arrival of fog was accompanied by an increase of wind to 15 knots. The experience shows that high afternoon temperature can result in large movement of surface air which can transport fog 30 mi during the afternoon. *Subject Headings:* **1. Synoptic case histories 2. Fog mechanics 3. Lincolnshire, Eng.**—*A.H.K.*

12.5–221 551.509.318:551.515.1

§Bukhalova, L. N., **Vykhod iuzhnykh tsiklonov na Zabaĭkal'e.** [Outbreak of southerly cyclones in Transbaikali.] *Dal'nevostochnyĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, No. 7:149–155, **1959.** 3 figs., 3 tables, 6 refs. **DWB**—The author attempts to determine the synoptic conditions of the development and movement of southerly cyclones over Transbaikalia twenty four hours in advance. Statistical data on the incursion of southerly cyclones into Transbaikali including the number of southerly cyclones per month entering Transbaikalia during the period 1945–1954 and the mean and extreme values per month of note of movement of sourtherly cyclones per day until incursion into Transbaikalia are presented. The synoptic characteristics of the incursion of southerly cyclones are discussed with the aid of synoptic maps. The incursions of cyclones were most frequent during the first half of summer and were entirely absent in winter (Dec.–Feb.). The condition for the origin of cyclones was the advection of cold air from the Kara Sea or from the Taimyr Penninsula to western Siberia, Mongolia and northwest China. For two days before the incursion of the southern cyclone the cold advection was manifested as a decrease of the OT^{500} height by 5–10 decameters over Pribaikalia and western Yakutia. The displacement of southerly cyclones over Transbaikalia followed two paths. The speeds of movement of the cyclones varied from 20 to 60 km/hour; they reached their greatest values in Nov. and the least in July and Aug. *Subject Headings:* **1. Synoptic conditions for cyclone development 2. Cyclone forecasting 3. Transbaikalia, Asiatic U.S.S.R.**—*I.L.D. and author's abstract.*

12.5–222 551.509.318:551.515.3

Dickson, Robert R. (*U. S. W. B., Nashville, Tenn.*), **Tornadoes of Jan. 21, 1959: a feature of a weather singularity?** *Monthly Weather Review*, Wash., D. C., 87(1):40–42, Jan. **1959.** 4 figs., 9 refs. **DWB, DLC**—The tornadoes of Jan. 21, 1959, in Tenn. and neighboring states are considered in relation to the New England January thaw singularity described by Wahl (1952). This singularity in the form of a warm spell occurs on the average on Jan. 20–22 at Nashville. At the time of the singularity there coexist certain conditions favoring severe storms: a tongue of warm moist air at the surface, a wind shift from southerlies during the warm period to cool northwesterlies immediately afterward, a 500 mb trough to the west with southwesterly winds and contour inflecting point over the Tennessee area, and the presence of a jet stream aloft. Review of the records reveals that tornadoes in the Arkansas, Alabama, Mississippi, Tennessee and Kentucky area have occurred more often during the singularity than at other times of the month. *Subject Headings:* **1. Tornadoes, southern U. S. (Jan. 1959) 2. Weather singularities 3. Tennessee 4. Southern U. S.**—*E.S.*

12.5–223 551.509.318

Grünewald, Günter, **Typisierung mitteleuropäischer Witterungsumschläge.** [Typing of reversals in weather conditions in Central Europe.] *Germany. Deutsche Demokratische*

Republik. Meteorologischer und Hydrologischer Dienst, Abhandlungen, 7(51), **1959.** 71 p. 24 figs., 9 tables, 15 refs. **DWB, DLC**—An attempt is made to establish and to typify similar synoptical predevelopments as reversals in weather conditions for the period 1931–1953 by applying the precipitation as parameter. Five deteriorating and six improving types were sufficient to establish the reversals in weather conditions. The statistical section of the work includes the examination, the most frequent lengths of the weather groups following the reversals and the percentage distribution of the consecutive types, besides the percentage proportion of the individual types on the reversals in weather conditions as well as their seasonal distribution. Furthermore an attempt was made to compute mean temperature changes for the times of the reversals in weather conditions of each type and their combination. Their reliability, however, varies, with the collective quantity as well as with the strength of radiation which has a different intensity for each type and for each season. Another attempt to achieve quantitatively characteristic precipitation distribution, proved to be unattainable because of the numerous factors affecting the precipitation formation. *Subject Headings:* **1. Weather type frequencies 2. Weather reversals 3. Central Europe.**—*Transl. of German summary (O.T.).*

12.5–224 551.509.318:551.511:551.577.32(5–012)

Murakami, T. (*Met. Res. Inst., Tokyo*), **The energy budget over the Far East during the rainy season.** *Meteorological Society of Japan, Journal, Ser. 2*, 37(3):83–95, June **1959.** 14 figs., 9 refs., 29 eqs. Japanese summary p. 95. **DWB, DLC**—It became clear that during the rainy season the region considered here is a source of kinetic energy, and a large surplus of kinetic energy is exported across the boundary to the central Pacific. The release of kinetic energy is directly related to the processes of sinking of cold air over the northern Japan Sea and of ascending of warm air in the region where subtropical jet stream prevails. As for the available potential energy, the region in question is a sink region. The import of available potential energy is mainly accomplished by two prevailing wind systems, i.e., SW- and SE-monsoon. *Subject Headings:* **1. Energy budget of rainy season 2. Far East.**—*Author's abstract.*

12.5–225 551.509.318:551.555.3(58)

Romanov, N. N. and Chanysheva, S. G., **Kratkaia aerosinopticheskaia kharakteristika perioda ekspeditsii v Gologdnuiu step' v fevrakemarte 1957g.** [Short description of aerosynoptic conditions during an expedition to Golodnaya Steppe in Feb.-March 1957.] *Sredneaziatskiĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, No. 2 (17):17–25, **1959.** 5 figs., ref. **DWB** (M(055) U581ts)—This paper contains a discussion of the general characteristics of the synoptic processes developing over Central Asia during an expedition to the Golodnaya Steppe, February–March 1957. Detailed synoptic descriptions are given of the periods before the beginning of an Ursat'ev wind, during its development and after its termination. The most favorable conditions for powerful development of an Ursat'ev wind is the presence of a deep macro-trough aloft with the axis directed approximately towards Egypt. The southwest branch of the planetary frontal zone aloft should pass through the Caucasus and the Caspian Sea. In the case of such a pressure field aloft, the Ursat'ev wind is produced by an intense drop in pressure over Central Asia brought about by an outbreak of strong south Caspian cyclones. Murgrab cyclones and intense disturbance curves are accompanied by briefer periods of outbreak of Ursat'ev winds. Northwest incursions without outbreak of cyclones or cyclogenesis over Central Asia independently of the intensity of invasion do not produce Ursat'ev winds. *Subject Headings:* **1. Synoptic conditions for Ursat'ev winds 2. Ursat'ev winds 3. Golodnaya Steppe, Kazakh S.S.R.**—*I.L.D.*

12.5–226 551.509.318:551.524.37(472)

*Smekalova, L. K., **Intensivnost' zamorozkov v usloviiakh razlichnogo mestopolozheniia na territorii Leningradskoĭ oblasti.** [Frost intensity in various locations of the Leningrad Region.] *Leningrad. Universitet, Uchenye Zapiski*, No. 269:96–122, **1959.** 9 figs., 15 tables, 13 refs. **DLC**—In this investigation of the influence of weather upon the intensity of frosts in different locations of Leningrad, the author divided the stations into "valley," "basins," near

swamps and near such large bodies of water as the Gulf of Finland and Lake Ladoga. The general synoptic conditions favoring the occurrence of frosts was examined by analyzing the trajectories of atmospheric particles at the $AT_{700\ mb}$ for late spring and early autumn frosts for the period 1949–1955 (35 cases) and an account is given of the trajectories of air particles at 850 mb and 700 mb surface vertical thickness of cold air masses, specific examples of cold air incursions in Leningrad Region, maximum cooling at different surfaces during cold air incursions in fall, spring and advective and transformational temperature changes. The results of the study indicate the following: late spring and early fall frosts are observed chiefly during the presence of a well developed anticyclone or of a rough over Leningrad Region. In the synoptic processes covering late spring and early frosts these exert very slight differences. The difference of minimum temperatures between stations with different locations does not remain constant during different synoptic conditions. The differences of minimum temperatures, computed for stations having different locations may be extended to other analogous locations in Leningrad Region where meteorological observations are not available. Forms of relief in anticyclone weather conditions in different seasons may behave differently. In spring large deviations are given by peaks of hills, smaller ones by lower forms, the series hold in the fall. In forecasting frosts in the most frost threatened regions, not allowing large errors, it is possible to equate the minimum temperature in the instrument shelter and the surface of the ground. The minimum temperature on the peaks of hills and the other parts of slopes will be 2–3°C. below the minimum temperature at the height of the instrument shelter. In the presence of a well developed anticyclone over the area the instrument shelter may be 5–7°C. The minimum temperature on the surface of the ground over an even or open locality is usually 1–2°C lower than at the height of the instrument shelter. *Subject Headings:* **1. Frost intensity 2. Synoptic conditions for frost 3. Frost forecasting 4. Leningrad Region, U.S.S.R.**—*I.L.D.*

12.5–227 551.509.323:551.524.35 551.509.314

Teich, M., **Wahrscheinlichkeitsvorhersagen über monatliche Temperatur-anomalien für Potsdam auf Grund der Erhaltungs und Wiederholungsneigung vorangegangener Temperaturpentadenanomalien.** [Probability forecasts of monthly temperature anomalies for Potsdam, considering the conservation and recurrence tendencies of preceding anomalies.] *Zeitschrift für Meteorologie*, Berlin, 13(9/10):232–237, Sept./Oct. **1959.** fig., 2 tables, 5 refs. German, English and Russian summaries p. 232. **DWB, DLC** -The tendency for persistence and repetition, which is beyond selected thresholds of temp. anomalies of the preceding month or pentade is more evident than a general review may reveal, is investigated. For this purpose the Potsdam 1877–1958/59 observational series are evaluated. Some useful rules are developed for the prediction of monthly temp. anomalies. *Subject Headings:* **1. Probability forecasts 2. Temperature anomaly forecasting 3. Potsdam, Germany.**—*Author's summary.*

12.5–228 551.509.324.3:551.524.37:634

Veitch, L. G. (*C.S.I.R.O., Adelaide*), **Further work on minimum temperature prediction in the fruit-growing areas of South Australia.** *Australian Meteorological Magazine*, Melbourne, No. 28:13–29, March **1960.** 2 figs., 5 tables, 3 refs., 5 eqs. **DWB**—Synoptic data from Renmark and Nuriootpa have been analyzed by using multiple linear regression, supplementing earlier work on frost prediction for Nuriootpa (Veitch 1959). It has been shown that the regression coefficients associated with radiational heat loss are homogeneous between years and between stations, but those associated with wind effects are distinct between the two stations. The constant terms of the regression equations are heterogeneous between stations and between years. Using 1800 C.S.T. data, the percentage of variance of minimum temperature explained by regressions is 70 at Nuriootpa and 80 at Renmark. If mean cloud cover overnight is used for Renmark regressions, the variance explained by regression rises to 86% providing direct evidence that errors associated with variable cloud cover fundamentally limit further progress. *Subject Headings:* **1. Synoptic analysis 2. Minimum temperature forecasting 3. Fruit culture 4. South Australia.**—*Author's abstract.*

12.5–229 551.509.324.1:656.71 551.509.325:656.71

Tandberg, Mads, **Occurrence and forecasting of local mist, fog and low stratus at Oslo airport (Fornebu) and in the Oslo area.** *Meteorologiske Annaler*, Oslo, 4(11):216–291, **1958.**

51 figs., 6 refs. **DLC**—A graphical report of a systematic study with a view to improving local forecasting at Oslo airport and of charts and hourly reports for 1949–1954. It has been assumed that sufficiently accurate prognostic charts are available and that it is possible to forecast cloud cover, precipitation, etc., which are not of a local nature. All cases were discussed, especially those where local mist, fog or low stratus might be expected or have in fact occurred. Some parameters, principles and rules were drawn from this preliminary study. Five useful parameters are described and inserted in a chart. In order to prove some of the theories and to provide, in selected weather situations, some reliable observations vertically up to 500 m, 30 radiosonde («wire-sonde») ascents were taken at Fornebu. These, to a great extent, confirm the theories of in and outflow in the fjord, the thermal circulation and the theories of R. S. Scorer, outlined in the study. The paper cites 26 ascents in the examples. *Subject Headings:* **1. Fog forecasting 2. Stratus forecasting 3. Forecasting for airports 4. Oslo, Norway.**—*I.S.*

12.5–230 551.509.325:551.575

Saunders, W. E., **Daytime fog clearance at Exeter airport.** *Meteorological Magazine*, London, 89(1,059):261–263, Oct. **1960.** 3 tables, 4 refs. **DWB, DLC**—All cases of radiation fog at Exeter in the period 0500–0700 during 1950–59 have been examined, in order to show the importance of the thickness of the fog layer and the presence of cloud at the time of clearance. A table is given demonstrating that fog with sky visible between 0500 and 0700 clears sooner than fog with sky obscured. A second table shows the obvious effect of the arrival of a cloud sheet on the fog clearance. It is suggested that the depth of fog with "sky visible" is not more than 300 ft. *Subject Headings:* **1. Fog clearance 2. Fog studies 3. Exeter, Eng.**—*R.B.*

12.5–231 551.509.33:061.3(51)

Dobryshman, E. M., **Vsekitaĭskaia meteorologicheskaia konferentsiia po dolgosrochnym prognozam pogody.** [All-China meteorological conference on long range weather forecasting.] *Meteorologiia i Gidrologiia*, Leningrad, No. 3:64–65, March **1959. DWB, DLC**—This Conference was held during Oct. 7–29, 1958 and was devoted to long range weather forecasting and the effect of the Tibetan Plateau and the Himalayan Mountains upon the formation of pressure fields and weather over China; an evaluation of the project of directions for short range weather forecasts and the results of recommended research and operational work in central and peripheral institutions. Papers were presented at plenary sessions and were discussed in territorial meetings. The opening paper dealt with artificial precipitation. The papers on long range forecasting either stressed the effect of the Pacific high and almost neglected the thermobaric field of the Urals or they disregarded the influence of the Pacific Ocean upon the western part depending whence the speakers came. Specific prognostic indications of the beginnings of a new synoptic period were presented, during the spring a quasi stationary front moves from southwest to northeast over northeast China. Classifications of synoptic processes for facilitating forecasts of temperature, precipitation, strong winds, frosts, etc. were presented. Papers were presented on forecasts of special phenomena such as the intense rains in the Yangtze basin and on typhoons, etc. *Subject Headings:* **1. Long range forecasting conferences 2. China.**—*I.L.D.*

12.5–232 551.509.331:551.524.32(497.1)

Manohin, V. (*Ljubljana*), **Vorhersage für den Winter 1958/1959.** [Forecast for the winter 1958/1959.] *Wetter und Leben*, Vienna, 10(5/7):92–93, **1958.** eqs. **DLC**—An attempt is made to forecast the 1958–1959 temperature for northwest Yugoslavia and the adjacent area of Austria on the basis of an 83-year cycle of winter temperatures in Ljubljana. The equalization of both corresponding temperature series proceeds according to the pattern $a+b/2$, $b+c/2$, $c+d/2$; where a, b, c . . . are three month totals of temperature deviations from the hundred year mean for Dec., Jan. and Feb. of the period 1851–1875. For correlation computation $X=(a+b/2)-M$ and $Y=(a_1+b_1/2)-M_1$ where a_1, b_1, c_1 = the corresponding three month totals of the temperature deviation of the period 1934–1938 and $M=[(a+b/2)+(b+c/2)+(c+d/2)+n]/n$, $M_1=[(a_1+b_1/2)+(b_1+c_1/2)+(c_1+d_1/2)t\cdots]/n$. The extropolation formula $b_1=2D+a+b-a-2M+2M$, is set up where D = the difference $X-Y$ for individual

years. It is shown that the mean temperature of the 1958–1959 winter will probably be 2.6 to 6.4°C below the normal and will be definitely below the long period average. On the basis of the 83-year period the winter of 1958–1959 will be cold and severe. The forecast can fail only if in the winter of 1958–1959 the difference $Y-X$ will have much higher values than observed hitherto. *Subject Headings:* **1. Seasonal temperature forecasting 2. Winter temperatures 3. Ljubljana, Yugoslavia.**—*I.L.D.*

12.5–233 551.509.314:551.577(94)

Kraus, E. B. (*Snowy Mts. Hydro-Elec. Authority, New South Wales*), **Numerical trial forecasts of precipitation in the Snowy Mountains of Australia.** *Australian Meteorological Magazine*, Melbourne, No. 26:1–17, Sept. **1959.** 6 figs., 7 refs., 5 eqs. **DWB**—Fisher-Tchebysheff orthonormal polynomials were used to represent the three-dimensional pressure distribution. Together with a number of other independent variables they were then related to Eucumbene catchment rainfall by means of a linear regression equation. This equation was subsequently used to forecast daily rainfall for 1957, which had not formed part of the original data. The correlation coefficient between actual and forecast rainfall on 91 days was 0.43, which is significant on the 0.1% level. The standard error of estimate was 0.145 inches. The results compared not unfavourably with those obtained by other methods for the same period. Although the results at this stage are not good enough to be of great operational value, they appear sufficiently encouraging to warrant further investigation. Plans for these investigations are discussed. *Subject Headings:* **1. Numerical forecasting 2. Precipitation forecasting 3. Australia.**—*Author's abstract.*

12.5–234 551.509.5:551.509.33

*Nordo, J., **Expected skill of long-range forecasts when derived from daily forecasts and past weather data.** *Norway. Meteorologiske Institutt, Scientific Report*, No. 4, **1959.** 31 p. 18 tables, 6 refs. eqs. **DWB** (M09.312 N863sc)—Some ways of estimating the autocorrelation function of successive temperature records are discussed. From this function we may derive estimates of the following quantities: 1. the variance of arithmetic mean values; 2. the correlation coefficient between successive means of various size; 3. the correlation of overlapping means; 4. the correlation of means separated by certain units of time. A simple extension to the multiple regression case provides us with correlation coefficients comparable with those obtained by present methods of "long-range" forecasting. The derived regression schemes may only contain short-range information, thus indicating that the score of "long-range" forecasts is mainly dependent on the skill of daily forecasting technique. This point does not seem to be generally appreciated. *Subject Headings:* **1. Forecasting skill 2. Long range forecasting skill.**—*Author's abstract.*

12.5–235 551.509.58:551.510.42

*Niemeyer, Lawrence E. (*U. S. W. B., San Francisco*), **Forecasting air pollution potential.** *Monthly Weather Review*, Wash., D. C., 88(3):88–96, March **1960.** 18 figs., 10 tables, 3 refs. **DWB, DLC**—A procedure for forecasting weather conditions conducive to high air pollution levels over a large area as a primary alerting system for potentially hazardous conditions is presented. Experiments conducted in the fall of 1957 and 1958 to test the procedure, are described. The results indicate that forecasts of macroscale meteorological phenomena can be used to signify periods of high air pollution potential. *Subject Heading:* **1. Forecasting atmospheric pollution potential.**—*Author's abstract.*

WEATHER CONTROL (551.509.6)

See also: **Weather control research, 12.5–2; Cloud physics research, U.S.S.R.** (Battan), 12.5–329.

12.5–236 551.509.612:634.8 551.509.318:551.524.37

Bogun, S. S. and Fedoseev, A. P., **Klimaticheskie usloviia vesny i merv sokhraneniia vinogradnikov ot zamorozkov v predgor'iakh Zailiĭskogo Ala-Tau.** [Climatic conditions in the spring and measures for protecting vineyards from spring frosts in the foothills of Ala Tau,

beyond the Ili River.] *Alma-Ata, Kazakhstan. Kazakhskiĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, 8:57–63, **1957.** 5 tables, 10 refs. **DWB**—Under the climatic conditions of southeastern Kazakhstan it is impossible to escape the damaging effects of spring frosts upon vineyards even when the vines are sheltered for a long while. Frosts may occur even 30–50 days after the constant passage of mean daily air temperature through +10°C. The formation of buds during the sheltered state increases the sensitivity of the vine to frost. An attempt is made to establish a meteorological indicator whose appearance would coincide with the maximum effective dates for opening vineyards. By means of this indicator it is possible to analyze the meteorological conditions of the spring period for many years and to utilize long range weather forecasts to evaluate weather conditions of a current spring. A comparison of the transition dates of air temperature through +5° and +10°C with the transition dates of +5° and +10°C in the soil at a depth of 20 cm, showed an extremely constant relationship so that for opening the vineyards air temperatures can be used. With the aid of data presented in graphs and tables the authors discuss the dependence of mean dates of stable transitions of air temperature through +5°C in spring upon elevation, mean long period dates of stable transitions of air temperature in spring through +5°C and their frequency by decades, probability of damage of vineyards by spring frosts, incidence of severe frosts after bud formation, duration of period with mean daily air temperatures above −10°C, sprinkling as frost protection, retardation of vegetation phase, etc. *Subject Headings:* **1. Frost protection of vineyards 2. Long range frost forecasting 3. Frost damage to vineyards 4. Ala Tau Mts., Asiatic U.S.S.R.**—*I.L.D.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

DENSITY (551.510.3)

See: **Behavior of atmospheric density profiles** (Sissenwine et al.), **12.5–98.**

ATMOSPHERIC COMPOSITION (551.510.4)

See also: **Discovery of atmos. condensation nuclei** (Verzár), **12.5–46.**

12.5–237 551.510.4:551.46

Welander, Pierre (*Univ. of Stockholm*), **On the frequency response of some different models describing the transient exchange of matter between the atmosphere and the sea.** *Tellus*, Stockholm, 11(3):348–354, Aug. **1959.** 6 figs., 3 refs., 15 eqs. **DLC**—A theoretical study is made of the response characteristics of two "box-models" and two continuous models of the sea which could describe an air-sea exchange of matter. It is demonstrated quantitatively that the box-model can depict a transient exchange process correctly only when the time of internal mixing of the sea is small compared to a certain "transfer time." Comparing the two continuous models studied, one of which assumes a purely diffusive sea and the other a purely advective sea, one finds some interesting differences in the response characteristics. *Subject Headings:* **1. Ocean-atmosphere exchange 2. Oceanographic models.**—*Author's abstract.*

12.5–238 551.510.41:546.264(48)

Bischof, Walter (*International Met. Inst., Stockholm*), **Periodical variations of the atmospheric CO_2-content in Scandinavia.** *Tellus, Stockholm*, 12(2):216–226, May **1960.** 15 figs., table, 10 refs. **DWB, DLC**—From the CO_2-data of the years 1955–59 for Scandinavia the annual cycle was determined. The picture is changing from year to year showing time displacements of the maxima and minima, which can, however, be placed "in phase" by shift of the time axis. One gets a mean value of the annual cycle of the years 1955–59 with two maxima and two minima. The total annual mean value obtained for Scandinavia is for 1955 326 ppm, 1956 321 ppm, 1957 323 ppm, 1958 315 ppm, 1959 331 ppm. *Subject Headings:* **1. Carbon dioxide variations 2. Atmospheric CO_2 variations 3. Scandinavia.**—*Author's abstract.*

12.5–239 551.510.41:550.4 551.510.41:546.264

Bolin, Bert (*International Met. Inst., Stockholm*) **Atmospheric chemistry and broad geophysical relationships.** *National Academy of Sciences, Wash., D. C., Proceedings*, 45(12):

1663–1672, Dec. 1959. 6 figs., 14 refs. **DLC**—A paper synthesizing a number of observations made in the field of atmospheric chemistry during recent years. The main features discussed are: 1) deposition of atmospheric pollutants, 2) atmospheric chemistry as part of geochemistry and 3) changes of the carbon dioxide content of the atmosphere. Numerous graphical representations illustrate the paper. *Subject Headings:* **1. Atmospheric chemistry 2. Atmospheric pollutants 3. Carbon dioxide in the atmosphere.**—*I.S.*

12.5–240 551.510.41:546.264

*†Bray, J. R. (*Univ. of Toronto*), **An analysis of the possible recent change in atmospheric carbon dioxide concentration.** *Tellus*, Stockholm, 11(2):220–230, May 1959. 7 tables, 57 refs. **DWB, DLC**—Criteria minimizing differences in operators, location, and time of observation are established for selecting comparative data on atmospheric CO_2 concentration during the past 100 years. The resulting selection showed in all cases the period 1907–1956 to have a higher mean than 1857–1906. The difference between means was not statistically significant for 5 unweighted comparisons. Weighting by estimates of reliability resulted in a significant difference for yearly and summer non-urban values, but not for the other 3 comparisons. Additional comparisons of all values in the study of six entire distributions, and of five paired studies with closely comparable data showed increases in a more recent period, with one exception. The magnitude of the increase for weighted yearly non-urban data was 25 ppm (from 294 to 319) for the quarters 1857–1881 to 1932–1956. Several possible explanations for the increase include: 1) an actual atmospheric increase, 2) a coincidence of the influence of microatmospheres, 3) improvement (or change) in chemical technique. Need for further sampling is emphasized and suggestions made for considering local influences in this sampling. *Subject Heading:* **1. Carbon dioxide in the atmosphere.**—*Author's abstract.*

12.5–241 551.510.41:546.13(789)

Crozier, W. D. (*New Mexico Inst. of Mining and Tech., Socorro, N. Mex.*), **Chloride particle measurements in the southwestern United States.** *American Geophysical Union, Geophysical Monograph*, No. 3:97–103, 1959. 2 figs., 6 refs. **DWB, DLC**—This paper presents some of the results of a program of collecting and counting atmospheric chloride particles, which was carried out as a part of the Airborne Particle Study of the New Mexico Institute of Mining and Technology, with support by the Office of Naval Research (Contract N7onr-450/1). The entire collection program covered the period from Aug. 1948 to Dec. 1951, but this paper is concerned principally with the systematic collections at ground level, made at Socorro, N. Mex., from Sept. 1949 to Dec. 1951. During the first 13 months of the chloride program the work was confined largely to collection by aircraft. Several flights were made in the Southwest and across country, as opportunities occurred. On two occasions significant concentrations of chloride particles were encountered in eastern California, and in one of these cases the chloride intrusion was followed as far as Illinois. Both these chloride-particle intrusions appeared to have originated in tropical disturbances off the coast of Lower California; the situations were described in two publications (Crozier, Seely, and Wheeler, 1952; Crozier and Seely, 1952). It appeared from the aircraft studies that considerable concentrations of chloride particles may sometimes occur far inland, and this led to the program of systematic collection at Socorro. The Socorro program was undertaken with the general aim of providing information of assistance in air-trajectory studies. To this end it was hoped that chloride peaks in New Mexico could be correlated with marine storms, as had been done in the two cases cited above. Several meteorologists studied data provided by the Socorro program, but no very definite results were obtained, and no publications resulted. Perhaps New Mexico was an unfortunate choice for such an investigation; air trajectories undoubtedly are complicated by the fact that chlorides may arrive from the Gulf of Mexico in the predominantly southerly surface air flow, which is not very deep, or they may arrive from the Pacific Ocean in the predominantly westerly air flow at the 700 mb level, and in many cases it probably is impossible to determine which. In fairness to the meteorologists, it should be said also that most of their studies were made on the basis of the data from the spot sampling, before the more detailed data from the hourly sampling available. *Subject Headings:* **1. Atmospheric chloride parties 2. Maritime aerosols 3. New Mexico.**—*Author's abstract.*

12.5–242 551.510.41(99)

Keeling, Charles D. (*Univ. California*), **The concentration and isotopic abundances of carbon dioxide in the atmosphere.** *Tellus*, Stockholm, 12(2):200–203, May 1960. 4 figs., table, 12 refs. **DWB, DLC.** Also shorter version as **Measurements of carbon dioxide in the atmosphere. American Geophysical Union, Transactions,** 41(3):512–515, Sept. 1960. 4 figs., table. **DWB, DLC**—A systematic variation with season and latitude in the concentration and isotopic abundance of atmospheric carbon dioxide has been found in the Northern Hemisphere. In Antarctica, however, a small but persistent increase in concentration has been found. Possible causes for these variations are discussed. *Subject Headings:* **1. Carbon dioxide in the atmosphere 2. Northern Hemisphere 3. Antarctica**—*Author's abstract.*

12.5–243 551.510.41(26)

†Lodge, James P., Jr.; MacDonald, A. J., Jr. and Vihman, Eero, **A study of the composition of marine atmospheres.** *Tellus*, Stockholm, 12(2):184–187, May 1960. 2 figs., table, 24 refs. **DWB, DLC**—Data on trace substances in air, obtained in mid-Pacific during two summers, are summarized. Particulate matter was analyzed for chloride, sulfate and nitrate; tests were performed for ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide. The results give information concerning the composition of marine air which can assist in evaluating possible natural contributions to urban pollution on the West Coast of the United States during the summer months, in addition to the geochemical value of the work. *Subject Headings:* **1. Marine atmosphere composition 2. West coast of U. S.**—*Authors' abstract.*

12.5–244 551.510.41:546.295

Moses, Harry E., Stehney, Andrew F. and Lucas, Henry F., Jr., **The effect of meteorological variables upon the vertical and temporal distributions of atmospheric radon.** *Journal of Geophysical Research*, Wash., D. C., 65(4):1223–1238, April 1960. 9 figs., 3 tables, 13 refs. **DLC**—Hourly values of radon concentrations were obtained simultaneously at four levels above ground up to 39.9 m on the Argonne Meteorology Tower on three separate days. Twenty-seven consecutive hourly measurements were made on the first two days and 17 on the third. Radon samples were obtained by adsorption on activated charcoal and were measured by means of scientillation counters. This technique, developed at Argonne, allowed direct measurement of radon instead of the common procedure of calculating radon values from measurements of daughter products. The large amount of meteorological data routinely obtained at the Argonne Meteorology Laboratory makes it possible to carry out detailed case studies on the relationship between radon concentration and the meteorological variables. This work has provided information on the heterogeneity of the horizontal distribution of radon. An inverse fumigation phenomenon was also observed. Under very stable nighttime conditions with light winds the radon concentrations observed at the top of the tower remained very low about the same as during the daytime. Shortly after sunrise, with an increase in vertical mixing the concentrations rose sharply. At a height of about 5.72 m the radon concentrations on the clear nights were larger by a factor of 20 than concentrations on the clear days. During cloudy conditions night-time values were about twice as large as daytime values. *Subject Headings:* **1. Radon in the atmosphere 2. Meteorological effects on radon distribution.**—*Authors' abstract.*

12.5–245 551.510.41

Paetzold, H.-K., **Neue USA-Forschungsergebnisse über die Erdatmosphäre.** [New results of U. S. investigations of the earth's atmosphere.] *Physikalische Blätter*, Mosbach/Baden, 13(9):395–403, 1957. 9 p. 3 figs., 3 tables, 5 refs., 4 eqs. **DGL**—As a result of a visit to the United States on the eve of the IGY, the author describes some of the more important investigations on the earth's atmosphere being carried out in the United States. These include research on the Los Angeles smog problem including the causes of smog, the photochemistry of ozone formation and toxicity of atmospheric ozone; investigations on atmospheric isotopes including the spread of atmospheric isotopes as a result of nuclear explosions and measurement of frequency relationships of stable isotopes such as that of isotopic oxygen and carbon, and the role of plants in isotope separation, the increase of C^{14} by the burning of fossile

fuels, and the effect of the CO_2 exchange between atmosphere and oceans on carbon isotopes; and the study of whistlers whose origin, frequencies, propagation and types are discussed. The advantages provided by large scale observation facilities, availability of complex and refined apparatus, favorable observational conditions for the United States' research and the possible type of research that could be carried on competitively in Germany are considered. *Subject Headings:* **1. Atmospheric composition 2. Atmospheric structure 3. Progress in meteorology.**—*I.L.D.*

ATMOSPHERIC POLLUTION (551.510.42)

See also: **Dispersal of stack gases** (Strom et al.), 12.5–87; **Relation of air pollution and cancer** (Mancuso), 12.5–90; **Irritant action of air pollutants** (Nelson), 12.5–91; **Forecasting atmos. pollution potential** (Niemeyer), 12.5–235; **Problems raised at the Symposium on Atmos. Diffusion and Air Pollution** (Batchelor), 12.5–264; **Polarographic properties of smog aerosols** (Mayrsohn, Mader), 12.5–339.

12.5–246 551.510.42:551.43:551.582(427.4)

Garnett, Alice (*University of Sheffield*), **Climate, relief and atmospheric pollution in the Sheffield region.** *Advancement of Science*, London, 13(52):331–341, March **1957.** 8 figs. **DLC**—Various contributing factors are discussed with stress on the night shift work at local factories, a time when the atmosphere is likely to be stable, hence favorable to accumulation of impurities. A series of maps prepared to show for a period of two years, the monthly record of SO_2 and solids in relation to both relief and monthly weather records, are given. Sheffield's site, climate and industrial pattern offer opportunities for an intensive survey. *Subject Headings:* **1. Atmospheric pollution studies 2. Climate of Sheffield, Eng. 3. Sheffield, Eng.** —*W.N.*

12.5–247 551.510.42:546.22

Jacobs, Morris B. (*Consulting Engineer, Bayside 64, N. Y.*), **Concentration of sulfur-containing pollutants in a major urban area.** *American Geophysical Union, Geophysical Monograph*, No. 3:81–87, **1959.** 3 figs., 10 tables., 10 tables, 13 refs. **DWB, DLC**—The concentration of sulfur-bearing pollutants in the major urban areas is a matter of considerable interest. The principal source of such sulfur-bearing pollutants is the burning of fuel for the production of heat, light, power, mass transportation, and the movement of vehicles. Other sources are the burning of refuse and garbage and open fires. Some idea of the magnitude of the amount of fuel used in a major urban area such as the City of New York can be gathered from Table 1 (Greenburg and Jacobs, 1956a). This large amount of fuel use can be additionally illustrated by Table 2 which shows the fuel consumption of a large utility. The range of the sulfur content of bituminous coal is 1 to 4.5% with an average value of about 2.5% but it should be remembered that anthracite coal also contains sulfur, the average amount being about 0.7% with many sources having higher concentrations. Fuel oils contain sulfur, in particular residual fuel oil and Blade (1955; 1956) shows that the sulfur content of No. 6 fuel oils in the eastern part of the U. S. ranges from a minimum of 0.5% to a maximum of 3.88% with an average of 1.46%. In the large urban area that we are discussing, work has shown that the average sulfur content is of the order of 3%. It can readily be seen that well over a million and a half tons of sulfur dioxide are given off to the general atmosphere every year in New York City (Greenburg and Jacobs, 1956a). From this some 2.2 million tons of sulfuric acid might be formed. The major sulfur-bearing pollutants are sulfur dioxide, sulfur trioxide, and hydrogen sulfide, and the discussion of the variation and concentration of sulfur-bearing compounds will be limited to these three. *Subject Headings:* **1. Atmospheric pollutants 2. Sulphur in the atmosphere 3. New York City.**—*Author's abstract.*

12.5–248 551.510.42:551.521.3:551.575.1

Petrov, G. D., **Opticheskiĭ metod opredeleniia spektra chastits vodnogo aerozolia.** [Optical method for determining the spectrum of water aerosol particles.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 5:796–797, **1959.** 4 figs., 6 refs., 2 eqs. **DWB, DLC.** Transl. into English in the corresponding number of its *Bulletin of the Academy of Sciences, USSR,*

Geophysics Series. **DLC**—The intensity of light scattered by a polydisperse medium within small angle θ is described by the formula $I(\theta_1\alpha) = I_0 \int_0^\infty J_1^2(\alpha\theta) N(D) D^2 dD$ where $J_1(\alpha\theta)$ = Bess function of the first order; $\alpha = \pi D/\lambda$, D = diameter of the dispersed particles, $N(D)$ = the fun tion of distribution sought. The solution of this formula is

$$N(D)D^2 = C\int^\infty \frac{d(\theta^3 E)}{d\theta} J_1(\alpha\theta)\, Y_1(\alpha\theta)\alpha\theta d\theta$$

where $J_1(\alpha\theta)$, $Y_1(\alpha\theta)$ = Bessel functions of the first and second orders respectively, E = illumina tion of screen the plane P, C = constant. The optical scheme of the apparatus for determinin distribution of aerosol particles according to size is presented. Also a curve of the absorptio of light by fog are presented. The spectra of fog for different moments of time in one sca function $N(D)D^2$ was standardized according to the absorption curve according to the formul

$$\frac{\int_{T_1} N(D)D^2 dD}{\int_{T_2} N(D)D^2 dD} = \frac{1gI_0/I_1}{1gI/I_2}$$

where I_0/I_1, I_0/I_2 = ratio of incident to absorbed light in the first and second moment and th integrals are experimentally determined functions of distribution at the same time. *Subje Headings:* **1. Aerosol spectrum 2. Light absorption by fog 3. Fog spectra.**—*I.L.D.*

12.5–249 551.510.42:6(43

Rassow, L. (*Met. and Hydrolog. Service, Halle, Saale*), **Zunahme der Immissionen in einer mitteldeutschen Industrieort.** [Increase of emissions in an industrial city in central Germany.] *Zeitschrift für Meteorologie*, Berlin, 13(1/6):68–69, Jan./June 1959. fig. German and Englis summaries p. 68. **DWB, DLC**—This paper covers the following two major points: 1) increas of dust fall, as concluded from 20 years of observational material; 2) suggestion that these dat be investigated jointly by hygienists, engineers and meteorologists. Emission measurement made since 1936 without major interruptions in the vicinity of a large chemical works in centra Germany, reveal a monthly dust amount of 33 g/m² at the beginning of the observational series having gradually increased up to an average of 67 g/m² during the following years, and de creased to the 1936 level after the end of the war. The emissions then increased again rapidly having arrived at a maximum average of 146 g/m² per month at present. This conspicuou increase has not been caused by corresponding changes of meteorological conditions. It i rather to be concluded that this is due to nonmeteorological factors governed by industria processes. These results do not allow general conclusions until similar observations fro other areas have been evaluated and made available. *Subject Headings:* **1. Dust fall data 2. Industrial atmospheric pollution 3. Germany.** —*Author's summary.*

TROPOPAUSE (551.510.528)

See: **Abnormally cold tropopause temp., eq. Pacific** (Jordan), **12.5–296.**

12.5–250 551.510.5:550.341.5:550.46

Tochilin, M. S., **Evoliutsiia atmosfery Zemli.** [The evolution of the earth's atmosphere.] *Priroda*, Moscow, No. 1:26–32, Jan. **1960.** 2 tables, 15 refs., eq. **DLC**—This is an attemp to describe the complicated problem of the evolution of the earth's atmosphere from the view point of geological and geochemical data. The geochemical facts confirming the changes tha took place in the composition of the earth's atmosphere and the way the earth affected th atmosphere are presented. It is pointed out that the problem of the evolution of the earth's atmosphere in connection with the past volcanic activity can hardly be isolated from suc important events that took place on the earth as the periodical extinction of animal species an groups, the settlement of the dry land with angiosperms at the end of the Mesozoic era, th change of climates, etc. *Subject Headings:* **1. Earth's atmosphere 2. Geology 3. Geochemistry 4. Atmospheric evolution.**—*A.M.P.*

12.5–251 551.510.52:551.524.7(436.14)

Steinhauser, Ferdinand, **Statistische Untersuchung der Inversionen im Luftraum über Wien.** [Statistical study of inversions over Vienna.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, Vienna, 11(4):427–457, **1960.** 2 figs., 15 tables, 4 refs. German, English and French summaries p. 427–428. **DLC** -The present investigation is based upon daily radio soundings, reaching the stratosphere, at 0300 and 1500 GMT in the years 1952 through 1956. The frequency of inversions in the troposphere and its dependence on the height of their lower boundary is given for all inversions at each observation time and month. The same is given for the lowest inversions only. The peculiarities of the annual variation of the inversion frequencies and their variations with height are discussed in detail. Further, the frequency of multiple inversions is stated for each month. The transition of inversion frequencies in the first 3000 meters from high values in the winter semester to low values in the summer semester occurs almost discontinuously between March and April, and is shown in a graph. The increase of the inversion frequency between Sept. and Nov. is somewhat slower. The vertical extent of inversion layers for each month and observation time is given for all inversions and separately for the lowest inversions only. The frequencies of the vertical extent of inversion layers and their variations during the year as well as their dependence on the height of the lower boundary of the inversions are discussed. The frequency of inversions with a thickness less than 400 m shows no pronounced annual variation, and the inversions with a thickness greater than 400 m are much more frequent in the winter than in the summer. There is a sudden drop of frequencies between March and April and a more gradual increase between Aug. and Oct. A further characterization of the structure and vertical extent of inversions is given by the frequency distributions of temperature differences between upper and lower boundary of the inversions. These frequency distributions as well as the frequency distributions of temperature gradients within the inversion layer and their dependence upon the height of the inversion are presented. Finally the relations between temperature difference from upper to lower boundary and thickness of the inversion are discussed. *Subject Headings:* **1. Inversions in the troposphere 2. Statistical studies 3. Vienna, Austria.**—*Author's abstract.*

STRATOSPHERE (551.510.53)

See also: **IGY** (Odishaw), 12.5–25; **Notes on Antarctic met.** (Prudhomme), 12.5–33; **Symposium on Physics of High Atmos.** (Singer), 12.5–44; **High level analysis and Forecasting techniques** (Veranneman), 12.5–53; **Vertical recovery of payloads** (Patterson), 12.5–64; **Propagation at great heights** (Millington), 12.5–66; **Behavior of atmospheric density profiles** (Sissenwine), 12.5–98; **Exosphere** (De Feiter), 12.5–116; **Geomag. trapped electron from an artificial source** (Welch, Whitaker), 12.5–143.

12.5–252 551.510.53:551.571.7:535.8

Houghton, J. T. (*Clarendon Lab., Oxford*) and Seeley, J. S. (*Univ. London*), **Spectroscopic observations of the water-vapor content of the stratosphere.** *Royal Meteorological Society, Quarterly Journal*, 86(369):358–370, July **1960.** 5 figs., 2 tables, 12 refs., 8 eqs. **DWB, DLC**—The water vapor content of the stratosphere has been deduced from records of the solar spectrum observed from a Canberra aircraft at altitudes up to 48,000 ft. The spectral region 3,790–3,860 cm^{-1} in the 2.7μ band has been separated into four groups of absorption lines whose rates of growth have been studied. Measurements in an altitude chamber of the absorption of very small paths of water vapor have been used to interpret the aircraft measurements in terms of absolute values of (pressure X quantity of water vapor)$^{\frac{1}{2}}$. Spectroscopic observations have been compared with measurements made by the frost point hygrometer. The overall results show that the water vapor content in a vertical column above 45,000 ft over southern England is about 4.5μ, corresponding to a mixing ratio of 3×10^{-6}, if this is assumed constant above the height of observation. *Subject Headings:* **1. Stratospheric water-vapor content 2. Spectroscopic observations 3. Southern England.**—*Authors' abstract.*

12.5–253 551.510.53:551.574.1

Telford, J. W. (*C.S.I.R.O., Radiophysics Lab., Sydney, Australia*), **Freezing nuclei above the tropopause.** *Journal of Meteorology*, Boston, 17(1):86–88, Feb. **1960.** fig., 2 tables, 5 refs.

DWB, DLC—Describes the role of freezing nuclei in the formation of natural rain. It has been suggested that the major portion of freezing nuclei may be formed from meteor showers. Here an experiment, giving information about the concentration of freezing nuclei above the tropopause, is described. The readings were taken at an altitude of 40–44 thousand ft and also below 30 thousand ft. The measurements show a high concentration of nuclei at high altitudes. The freezing nuclei count above the tropopause is not very different from that immediately below it. *Subject Headings:* **1. Freezing nuclei count 2. Rain formation 3. Meteor showers 4. Tropopause.**—*A.H.K.*

OZONOSPHERE (551.510.534)

See also: **Obs. of ozone distribution by airborne spectrographs** (Yamasaki, Akita), 12.5–192.

12.5–254 551.510.534:551.501.71

Brewer, A. W.; Dütsch, H. U.; Milford, J. R. et al., **Distribution verticale de l'ozone atmosphérique: comparaison de diverses méthodes.** [Vertical atmospheric ozone distribution: comparison of various methods.] *Annales de Géophysique*, Paris, 16(2):196–222, March/June **1960.** figs., tables, refs. French, English and Russian summaries p. 196. **DLC**—In order to compare various methods for measuring the vertical atmospheric ozone distribution, simultaneous determinations were made at Arosa using four different techniques. Among the four methods two are indirect: the "Umkehr" effect and the infrared method; the two other methods i.e. electro-chemical soundings and optical soundings are direct. A description of the main parts and the functioning principle of the electro-chemical ozone sonde are given in Part II of the article (A. W. Brewer and J. R. Milford). The detection of ozone is by its well-known reaction with neutral potassium iodide solution which releases iodine according to the equation:

$$2KI + O_3 + H_2O = 2KOH + I_2 + O_2.$$

Part III (H. U. Dütsch) deals with vertical ozone distribution from the "Umkehr" effect. After having set forth the principle of the method, the author deals with the observations during the period of intercomparison. Vertical ozone distribution has been observed simultaneously by infrared spectroscopy and the "Umkehr" method during two years (Oct. 1956 through Oct. 1958) and intercomparison of these measurements by two direct methods was only done during one month in the summer of 1958. The comparison of the results obtained by the four methods is plotted on a graph. Part IV (H. K. Paetzold and F. Piscalar) is devoted to observations made by the optical method, and the results obtained by the infrared method are reported in Pt. V (E. Vigroux). The paper ends with considerations and attempts to explain the differences found between the results obtained by the various methods. *Subject Headings:* **1. Vertical ozone distribution measurement techniques 2. Arosa, Switzerland.**—*A.V.*

12.5–255 551.510.534:551.513.1:551.524.7

Godson, W. L., (*Dept. of Transport, Toronto*), **Total ozone and the middle stratosphere over Arctic and sub-Arctic areas in winter and spring.** *Royal Meteorological Society, Quarterly Journal*, 86(369):301–317, July **1960.** 10 figs., 36 refs. **DWB, DLC**—It is well known that the Arctic stratosphere customarily exhibits a rapid transition from winter to summer which has a permanent warming effect on stratospheric temperatures and causes a marked decrease in the intensity of the circulation at mid-stratospheric levels. Prior to this final warming, temporary warmings occur with a marked effect only in sub-Arctic areas. These phenomena are closely related to the rapid increase in total ozone which takes place in the late winter and early spring in polar regions. The major ozone maximum occurs at the time of the final warming, with a magnitude dependent on the intensity of the rapid warming at high levels in the stratosphere. Earlier baroclinic waves during the winter cause closely correlated ozone changes, resulting in a stepwise increase in ozone prior to the final warming. 10-day running means of total ozone and of 100 mb temperature are compared for stations in northern Europe and in Canada; these reveal the relations between long-period changes and processes in total ozone and in the middle stratosphere. In particular, one may thereby explain the seasonal

behavior of total ozone, which departs so markedly from photochemical prediction, as well as the vital dynamical role played by active centers in the stratospheric warm belt (especially in the Aleutian area) in the production of warm ozone-rich stratospheric air masses. *Subject Headings:* **1. Ozone distribution 2. Stratospheric warming 3. Sub-Arctic 4. Arctic.**—*Author's abstract.*

12.5–256 551.510.534:551.521.31

Mateer, C. L. and Godson, W. L. (*both, Meteorological Service of Canada, Toronto*), **The vertical distribution of atmospheric ozone over Canadian stations from *umkehr* observations.** *Royal Meteorological Society, Quarterly Journal*, 86(370):512–518, Oct. 1960. 9 figs., 2 tables, 8 refs. **DLC, DWB**—The vertical distribution of ozone is estimated from *umkehr* observations at the Canadian ozone stations at Edmonton, Moosonee and Resolute. Average seasonal vertical distributions are presented and compared with European and Indian results. The Canadian results indicate the existence of two levels of maximum ozone density, one at about 27 km and a lower one at about 15 km. During the spring, summer and autumn seasons the higher-level maximum is slightly more predominant than the lower. However, during the winter months, the lower-level maximum becomes much more pronounced. As a result, there is an extremely good correlation between ozone amount between 12 and 24 km and total ozone, three-quarters of the seasonal changes in total ozone being attributable to changes in this layer. *Subject Headings:* **1. Vertical ozone distribution 2. Umkehr observations 3. Canada.**—*Authors' abstract.*

12.5–257 551.510.534:535.243

*Walshaw, C. D. (*Cavendish Lab., Cambridge*), **The accuracy of determination of the vertical distribution of atmospheric ozone from emission spectrophotometery in the 1,043 cm^{-1} band at high resolution.** *Royal Meteorological Society, Quarterly Journal*, 86(370):519–529, Oct. 1960. 2 figs., 4 tables, 9 refs., several eqs. **DLC, DWB**—A method is outlined for obtaining the vertical distribution of atmospheric ozone from ground-level measurements of the downcoming thermal radiation in the region of the 1.043 cm^{-1} (9.6μ) band. The emission measurements are such as may be made with a grating spectrometer of the Goody type; the slit width is about 2.5 cm^{-1}, enabling interference from water vapour and carbon-dioxide lines to be eliminated. Estimates are made of the various sources of error, using a model atmosphere having three ozones variables (which are the ozone contents of the layers 1000–600, 600–300 and 300–50 mb), and basing the analysis on four combinations of wave number and zenith angle of observation. It is concluded that results of useful accuracy may be obtained for the two tropospheric layers, but that the method is not sufficiently sensitive to give significant information on the upper layer. The continuous absorption over the region lowers the accuracy appreciably but does not affect the main conclusion. *Subject Headings:* **1. Vertical ozone distribution determinations 2. Atmospheric models 3. Emission spectrophotometry.**—*Author's abstract.*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE (551.511)

See also: **Dynamic met.** (Kibel'), 12.5–4; **Antarctic divergence and feeding grounds of whales** (Beklemishev), 12.5–167; **Melting of pack-ice field** (Akagawa), 12.5–171; **Energy budget during rainy season, Far East** (Murakami), 12.5–224; **Distribution and variability of cold front precip.** (Cox), 12.5–281; **Radiation and met.** (Möller), 12.5–285; **Strong thermal advection, Budapest 1958** (Aujeszky), 12.5–293; **Pressure difference between cloud and its environment** (Van Thullenar), 12.5–302; **Generalization of the mixing-length concept** (Businger), 12.5–303; **Max. wind speeds in various parts of jet streams** (Avvakumov), 12.5–317; **NASA reactor facility hazards summary,** 12.5–399.

12.5–258 551.511:551.513

Roulleau, J., **Les grands problèmes de la météorologie: difficultés physiques et difficultés théoriques.** [Great problems in meteorology: physical and theoretical difficulties.] *La Météorologie*, Paris, Ser. 4, No. 56:257–262, Oct./Dec. 1959. French, English and Spanish summaries p. 257. **DWB**—The mechanical and thermodynamical causes of the formation and the maintenance of semi-permanent anticyclone and also their origin and evolution of dis-

turbances constitute the main and unresolved problems of meteorology. The problems can only be treated on a synoptic scale. In order to eliminate the disturbing influence of the topography, it is necessary to study them mainly above the oceans but unfortunately it is there that the observational network is thinnest. It may as well be pointed out that there is general tendency of neglecting these problems which form the basis of the theory of general circulation. On the other hand, the small-scale problems such as cloud physics and the turbulence have attracted a larger number of workers during the past few years. It is also of interest to underline the importance of a profound thermodynamical study of the atmospheric movements; for an example it is shown how this can provide a quantitative explanation for the real decrease of temperature with altitude. *Subject Headings:* **1. Thermodynamics of the atmosphere 2. General circulation 3. Atmospheric disturbances 4. Convective thunderstorms 5. Atmospheric diffusion.**—*Author's abstract.*

12.5–259 551.511.2:533.7

Wilkins, Eugene M. (*Temco Aircraft Corp.*), **Dissipation of energy by atmospheric turbulence.** *Journal of Meteorology*, Boston, 17(1):91–92, Feb. **1960.** fig., 10 refs., 2 eqs. **DWB, DLC**—The author presents Gifford's calculations on the rate of energy dissipation by atmospheric turbulence. The data on which these calculations are based are shown in a graph with a view to illustrating the variation in the dissipation of kinetic energy with height. It also indicates that 55% of the total kinetic energy dissipated in the troposphere occurs in the lowest km. *Subject Headings:* **1. Atmospheric turbulence 2. Energy dissipation in the atmosphere.**—*A.H.K.*

12.5–260 551.511.13:551.571.7

Ackermann, P., **Die neue Theorie des indifferenten Gleichgewichtes in der praktischen Anwendung.** [The practical application of the new theory of the indifferent equilibrium.] *Meteorologische Rundschau*, Berlin, 12(6):182–183, Nov./Dec. **1959.** 4 figs., 1 eq., 2 refs. German summary p. 182. **DWB, DLC**—The new formula for dry adiabats to be inscribed on a tephigram is:

$$\frac{\rho}{\rho_0} = \frac{r_0^2}{r^2}\left(\frac{T}{T_0}\right)^{\frac{C_v+3\beta}{R}}$$

In the application of this new formula to a sounding of Payerne it is shown that those layers in which the temperature gradient exceeds 6.3°C/km could undergo mixing. During the vertical displacement of air, the specific humidity of the air parcel did not alter while the relative humidity increased in upward motion and decreased in the downward motion. It is shown that after complete mixing there is a maximum of relative humidity at the upper boundary and a minimum at the lower boundary in the case of gradients exceeding 6.3°C/km. The comparison the the classical and improved adiabatic formulas showed that according to the former mixing could occur only on the 4.8–4.8 km layer. Only the new theory can explain maximum humidity values at higher altitudes. The increase in relative humidity with height in mixing layers proceeded parallel to the magnitude of the temperature gradient. *Subject Headings:* **1. Adiabatic formulas 2. Relative humidity distribution.**—*I.L.D.*

12.5–261 551.511.2:531.65

Fjørtoft, Ragnar (*Norwegian Met. Inst., Oslo*), **Some results concerning the distribution and total amount of kinetic energy in the atmosphere as a function of external heat sources and ground friction.** (In: Bolin, Bert (*ed.*), **The atmosphere and the sea in motion.** N. Y., Rockefeller Institute Press, **1959.** p. 194–211. 5 tables, 10 refs., 90 eqs.) **DLC**—In a long-term steady state of the atmosphere there is necessarily a positive correlation between potential temperature and vertical velocity whereby the work of gravity can balance frictional dissipation of kinetic energy. (By the phrase "work of gravity" it is meant only a certain component part of the total work of gravity, the latter of course being zero in a steady state. In this paper it is essentially the work exerted by gravity if only those components of vertical velocity are considered which are compensated in each horizontal plane.) The corresponding stabilization in the vertical is offset by a cooling in high levels relative to the lower levels. In a vertically stable atmosphere this will tend to decrease total variance of potential temperature. To keep

this constant it is, therefore, necessary in a gravitationally stable atmosphere, to have a horizontal distribution of heating whereby relatively warm regions are heated and cold regions cooled. We might formulate this in other words by introducing the total variance of the deviation of potential temperature from its horizontal mean. This variance is steadily decreased in a vertically stable atmosphere because of the warming by downward currents in the cold region and cooling by ascending currents in the warm region. The balance is maintained by the forementioned horizontal distribution of heating (LORENTZ 1955). For motions satisfying approximately the thermal wind balance equation, it is possible to eliminate vertical velocities in the integral expressing the work of gravity. It follows that this work, save for a positive proportionality factor, essentially equals the change which by advection alone would be caused in the square of the horizontal temperature gradients integrated over the total atmosphere. Since the total square of potential temperature is unaffected by advection, it is necessary to have an advective flow of temperature amplitude, or variance, from horizontally larger to smaller scales. The large-scale temperature field, on which the smaller scale fields ultimately feed, essentially is a zonal one, we let this be represented by zonally averaged temperatures, while the corresponding eddy temperatures are used for the small-scale field. The total horizontal temperature variance is a sum of the pure large-small scale parts. The advectively conditioned change in one of them equals, with opposite sign, the corresponding change in the other, and is proportional to the meridional gradient of mean potential temperature and the eddy flux of potential temperature. The rate at which the eddy variance is increased by this large-scale turbulent mixing process determines also, when it is multiplied by the difference the inverse of the squares of two wavelengths characterizing the typical scales of the mean and eddy field, the rate at which the integrated horizontal gradient squared is increased advectively, and thereby also the long-term effect of gravity forces. This is essentially used to balance dissipation in the eddy motion which is put proportional to surface eddy kinetic energy. Besides this balance condition we have two others. The one expresses that the advectively conditioned increase in eddy temperature variance is balanced, both by a damping due to heating, and the temperature effects of vertical motions. The other expresses that differential heating in meridional direction balances the drop, by advection, in amplitude of the mean temperature field. Of these three balance conditions, the first two determine a relation between the meridional gradient of mean temperature, vertical stability, and the typical wavelengths of the mean and eddy temperature fields. It is concluded that (1) a lower limit for the meridional temperature gradient exists below which no eddy motion is possible in a long-term steady state, and (2) that an upper and lower limit for the characteristic wavelength of the eddy temperature field exist beyond which the meridional temperature gradient becomes so large that the third balance condition is violated, whereby instead the equatorial regions are cooled and the polar regions warmed. For wavelengths between these critical limits eddy solutions are possible with varying amounts of surface eddy and "mean" kinetic energy, and eddy and "mean" temperature variance, depending essentially on the typical wavelength for which the effect of gravity forces becomes a maximum in the eddy motion. In finding this wavelength it is at first assumed that vertical stability might be considered a quasi-constant. Next stability is considered to increase with increasing effect of the gravity forces which has the forementioned stabilizing influence in the vertical. It is shown that particular solutions exist for which the effect of gravity will increase with increasing meridional differential heating due to external sources. The corresponding increase in vertical stability will cause a shift of the typical wavelength towards higher values because of the way in which the critical wavelengths depend upon vertical stability. It is pointed out that this is in agreement with the results of rotating fluid experiments. Finally, the theory is tested to some extent on atmospheric conditions. *Subject Heading:* **1. Kinetic energy in atmosphere.**—*Author's abstract.*

12.5–262 551.511:551.513.1:551.509.312

Gambo, K. (*Japan Meteorological Agency, Tokyo*), **Geostrophic approximation related to the scale effect of atmospheric disturbances.** *Geophysical Magazine*, Tokyo, 29(4):535–556, March 1960. 8 figs., 10 refs., numerous eqs. **DWB, DLC**—Geostrophic barotropic forecasts are compared with the balanced barotropic forecasts during the summer of 1959. In these comparisons, it was found that there were no definite differences in so far as longer waves are

concerned. In cases that we observed the typhoon in the forecast domain, we found some discrepancies. These results are summarized from the standpoint of the scale effect of atmospheric disturbances. In the latter part of this paper, the scale effects are discussed by using the non-dimensional equations of motion. The Rossby number in connection with the G number, which is defined as the ratio of divergence of wind velocity to the vorticity, and the Richardson number is emphasized as the main factor which controls the balance of kinetic and available potential energies in the atmosphere. *Subject Headings:* **1. Geostrophic forecasting 2. Barotropic forecasting 3. Scale effect of atmospheric disturbances.**—*Author's abstract.*

12.5–263 551.511.6:551.524.4:551.551.8:551.558.1

Ball, F. K. (*C.S.I.R.O. Div. of Meteorological Physics, Australia*), **Control of inversion height by surface heating.** *Royal Meteorological Society, Quarterly Journal,* 86(370):483–494, Oct. 1960. 5 figs., 14 refs., 16 eqs. **DLC, DWB**—Viscous dissipation is inadequate to account for the destruction of all the thermal turbulence generated by upward transfer of heat in a deep convection layer. It is suggested that the surplus turbulent kinetic energy is destroyed by buoyancy forces in a region of downward transfer of heat in the upper part of the convection layer. This process is associated with mass transfer downwards through the convection (or subsidence) inversion and also with an upward movement of the inversion, though the latter may be overcome by sufficiently strong subsidence. A simple theory of the process is developed and the results deduced thereby agree well with observations of the diurnal variation of inversion height in Central Australia. *Subject Headings:* **1. Heat transfer in convection layers 2. Inversion heights 3. Central Australia.**—*Author's abstract.*

12.5–264 551.511.6:551.510.42(08)

Batchelor, G. K. (*Cavendish Lab., Cambridge, Eng.*), **Some reflections on the theoretical problems raised at the symposium.** *Advances in Geophysics,* N. Y., Vol. 6, pub. 1959. p. 449–452. 5 refs. **DWB, DLC**—In evaluating the Symposium on Atmospheric Diffusion and Air Pollution held at Oxford, Aug. 24–29, 1958 the author points out that no really new and important theoretical ideas were presented. Very striking, however, was the extent to which meteorologists and field workers use the concepts and methods of turbulence theory. The author divides the problem discussed at the Symposium into three groups: (1) the distribution of mean concentration of material released from a steady source; (2) characteristics of diffusions from fixed sources other than the distribution of mean concentration and (3) relative diffusion, that is the diffusion of marked fluid particles relative to each other. Brief statements on the analysis and solution of these problems as presented in various papers are presented and evaluated critically. *Subject Headings:* **1. Turbulence theories 2. Atmospheric diffusion 3. Air pollution symposia.**—*I.L.D.*

12.5–265 551.511.6

Berliand, O. S., **Ob odnom zamknutom reshenii uraveniia turbulentnoi diffuzii.** [A closed solution of the turbulent diffusion equation.] *Akademiia Nauk SSSR, Doklady,* 130(3): 526–529, **1960.** 2 figs., 11 eqs. **DLC**—The solution of the equation of turbulent diffusion

$$\frac{\partial q}{\partial t}+u_x\frac{\partial q}{\partial x}+u_z\frac{\partial q}{\partial z}=\frac{\partial}{\partial x}\left(k_x\frac{\partial q}{\partial x}\right)+\frac{\partial}{\partial y}\left(k_y\frac{\partial q}{\partial y}\right)+\frac{\partial}{\partial z}\left(k_z\frac{\partial q}{\partial t}\right)$$

can be represented in the form $q=q_z(x_1t)q_y(y_1t)q_z(z_1t)$. This gives rise to a series of equations from which is derived the expression

$$q_z=\frac{\exp\left[-(u_z^2/4k_z)t\right]\cos h\sqrt{a}}{\pi k_z}\int_0^\infty\frac{\exp\left[-(u^2/4k_z)t\right]\cos h\sqrt{an^2+\beta}}{1+(A/u^2)\sin^2H\sqrt{au^2+\beta}}$$

The computation of the integral is illustrated. By means of this formula two examples for $h=0$ were calculated, and the results are shown on a graph. The calculations show the following: 1) Even in the best case when $\bar{u}_z=1$ m/sec the average of the vertical component of wind velocity in the equation of turbulent diffusion may lead to a difference of 2–3 times in the

calculated concentration as compared with concentrations calculated according to the wind profile $u_z(z)$ close to the actual one and 2) the form of the function $u_t(z)$ in the region $II < z < \alpha$ shows no perceptible effect on the distribution of concentration near the ground. *Subject Heading:* **1. Turbulent diffusion equations.**—*I.L.D.*

12.5–266 551.511.6

Ellison, T. H., **Turbulent diffusion.** *Science Progress*, London, 47(287):495–506, July **1959.** 14 refs., 23 eqs. **DLC**—A detailed discussion of the problem of diffusion from finite sources and the relative diffusion of a cluster or cloud, based on work of G. K. Batchelor (1949–52) and Batchelor and Townsend (1956). The general approach made by G. I. Taylor (1915–1921) and L. F. Richardson (1926) is reviewed and application made to single particle diffusion of a pollutant, with Lagrangian analysis of the displacement with time, and to the special case of diffusion from a point source on the surface of a logarithmic boundary layer and the limitations of the K-equation. Finally, the case of two particle diffusion as it relates to the scale of turbulence is discussed and the Kolmogorov theory applied to smoke puffs and balloon dispersion. *Subject Heading:* **1. Turbulent diffusion theories.**—*M.R.*

12.5–267 551.511.6:551.551.2:551.554

Frankenberger, E., **Über den Vertikalaustausch.** [On vertical exchange.] *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 32(3/4):283–299, **1960.** 5 figs., 7 tables, 12 refs., 13 eqs. German, English and French summaries p. 283–284. **DWB, DLC**—During 270 hours of the IGY the turbulent vertical windcomponent $\tilde{w}$ has been measured at 3 m altitude by means of a heatwire apparatus and the other components by means of a balsawood instrument in heights of 3, 16 and 70 m. The dependency of the quotients $\tilde{w}/\bar{u}$ ($\bar{u}$ wind velocity) upon the temp. stratification shows that the turbulent energy at the lower altitudes depends upon the roughness of the ground, but the turbulent energy at 70 m altitude upon the friction caused by the greater obstacles of the surroundings. The Reynolds stress data in connection with the windshear at greater altitudes enables to calculate diffusion coefficients, which have been compared with empirical diffusion coefficients gained by means of the heatbalance of the ground and the vertical temp. profiles. The differences are small compared with the inaccuracies caused by the variations of the wind profile. The influence of the size of time used for the formation of mean values has been discussed in connection with an example. Mean hourly values of the gradients and the vertical fluxes are still applicable for altitudes of some dekameters. During strong inversions near the ground the heat transfer by absorption and radiation of wet air became apparent. Frequency data of the exponent m of the wind-height function $u/u_1 = (z/z_1)^m$ in connection with the frequency of wind velocities have been published, which enable to calculate the amount of heat transduced by diffusion from the ground surface to the atmosphere at Quickborn. The upward flux is about 12,000 cal/cm² year and the downward flux—4700 cal/cm² year. Some remarks concerning the diffusion from elevated source points have been made. *Subject Headings:* **1. Turbulent exchange in the lower atmosphere 2. Wind profiles 3. Reynolds stress.**—*Author's summary.*

12.5–268 551.511.6:551.551.5:551.558.2:536.24

Hollmann, Günther, **Der mikroturbulente Vertikalaustausch von Masse und Wärme: ein Beitrag zur Lösung des Wärmeaustausch-Paradoxons von W. Schmidt.** [Microturbulent vertical exchange of mass and heat: a contribution to the solution of the heat-exchange paradox of von W. Schmidt.] *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 32(3/4):161–194, **1960.** Fig., 53 refs., 175 eqs. German, English and French summaries p. 161–163. **DWB, DLC**—After a discussion of the theory of the micro-turbulent heat flow of Wilh. Schmidt and the proposals of various authors for the solution of the so called heat-exchange paradox the problem is formulated again. The development of the theory has a certain similarity with a paper by H. P. Schmitz, even though the conclusions do not coincide completely. The complete micro-turbulent heat flow consists of two parts. One depends essentially on the micro-turbulent mass flow, the other on the micro-turbulent temp. fluctuations. With the restricting assumption that the averaged quantities are independent of the horizontal coordinates it is possible to treat the adiabatic equation, the equation of state, the equation of continuity, and

the static equation for the smoothed pressure as a self-contained system and to dissociate them from the equations of motion. By a suitable combination of the four equations four new relations are obtained which permit one to represent the vertical mass flow, the vertical heat flow, the work of the pressure field, and the work of expansion of the turbulent components by the turbulent exchange of the potential temp. The micro-turbulent mass flow is directed upward in a hydrostatically stable atmosphere and contributes therefore to a heat flow upwards. That part of the heat flow which results from the turbulent temp. variations is under the same conditions directed downward, and agrees in the lower layers of the atmosphere for all practical purposes with the result of WILH. SCHMIDT. The influence of the mass flow on the heat flux, which was disregarded by all authors except H. P. SCHMITZ is of the same order or magnitude as the influence of the temp. variations. The complete micro-turbulent heat flux is represented by an equation which contains the coefficient of turbulent mass exchange and the temp. gradient at all lower levels. If the stratification is less than adiabatic everywhere the heat flux is downward, but of much smaller magnitude than according to the theory of WILH. SCHMIDT. The turbulent temp. change depends in general on three quantities which can all be expressed by the turbulent mass transfer. The author looks for a solution of the heat-exchange paradox, which should really be supplemented by a mass-exchange paradox, by means of the spectral distribution of turbulence. The fields smoothed with regard to micro-turbulence belong to the microturbulent part of the spectrum. This division of the turbulence spectrum seems justified according to the present empirical data, since a broad gap exists between the two regions (maximum of microturbulence at a period of one minute, maximum of micro-turbulence near a period of four days). The so-called turbulence heat flux refers to the micro-turbulent region of the spectrum and may very well be directed downward without contradicting our picture of the atmospheric heat balance, because the microturbulent heat flux is presumably larger than the former by an order of magnitude. *Subject Headings:* **1. Heat exchange 2. Micro-turbulent vertical exchange 3. Vertical motion 4. Turbulent temperature variations 5. atmosphere heat balance.**—*Author's summary.*

12.5–269 551.511.6:532.517.4

Kampé de Fériet, J. (*Inst. de Mécanique des Fluides, Univ. de Lille, France*), **Statistical mechanics and theoretical models of diffusion processes.** *Advances in Geophysics*, N. Y., Vol. 6, pub. **1959.** p. 139–147. 9 refs., 7 eqs. **DWB, DLC**—A mathematical and theoretical consideration of the problem of developing a statistical theory of turbulence involving the application of statistical mechanics to a dynamical system. The construction of a statistical mechanism as one aspect of the definition, a random solution of the differential equation defining the motion of a continuous medium is illustrated by the angle of the statistical mechanics of a vibrating string with fixed ends. The case of an incompressible viscous fluid filling the whole space is considered and a model of the velocity field during homogeneous turbulence at a given time is discussed. *Subject Headings:* **1. Turbulence theories 2. Diffusion processes 3. Statistical theory of turbulence.**—*I.L.D.*

GENERAL CIRCULATION (551.513)

See also: **Vertical motions and transversal circulations . . .** (Defant), 12.5–14; **Arctic circulation in summer** (Kunkel), 12.5–28; **Total ozone and middle stratosphere, Arctic and sub-Arctic** (Godson), 12.5–255; **Physical and theoretical problems in met.** (Roulleau), 12.5–258; **Cirrus clouds associated with jet stream** (Pellegrini), 12.5–346; **Drought in Bai-u season, Hokuriku District** (Tomioka), 12.5–358.

12.5–270 551.513:523.746

*Ped', D. A. and Sidochenko, T. V., **O prichine kolebanii intensivnosti zonal' noi tsirkuliatsii atmosfery.** [The cause of the variations in the intensity of atmospheric circulation.] *Meteorologiia i Gidrologiia*, Moscow, No. 9:20–24, Sept. **1959.** 1 fig., 4 tables, 15 refs. **DWB, DLC**—An analysis of variations in the intensity of the zonal circulation of the atmosphere and the explanation of the variations are presented. Indices of the zonal circulation of the atmosphere (I_{w-E}) were computed for the period 1938–1957 on the basis of AT_{500} maps for the territory situated between 40°–72°N lat and 20°W–20°E long. Data are presented on the

mean annual values of the intensity of the zonal circulation of the atmosphere, on the correlation between circulation (I_{N-E}) of a given month i and the preceding months ($i-1$, $i-2$) by seasons for the period 1938-1957, on the correlation between monthly values of intensity of zonal circulation and Wolf numbers, and on the synchronization between mean monthly indices of zonal circulation on different regions and at different levels according to 6-month periods (1949–1956). It is concluded that the mean annual oscillations of intensity of zonal circulation are determined largely by mean annual fluctuations of solar activity, with increase of the latter the intensity of the zonal circulation in the troposphere increases and vice versa. This influence is manifested in the annual values of intensity of zonal circulation for shorter periods. Apparently the circulation for short periods of time and its fluctuation is determined by terrestrial causes. These individual characteristics of the circulation are smoothed out in mean annual values so that a general annual background remains largely depending upon solar activity. *Subject Headings:* **1. Atmospheric circulation—solar activity relationships 2. Zonal circulation.** —*I.L.D.*

12.5–271 551.513(264,267,99)

Tanabe, S., **Weather conditions in the Southern Hemisphere with special reference to the Shōwa Base from Jan. to the beginning of Feb. 1959.** *Journal of Meteorological Research*, Tokyo, 11(8):667–673, Aug. 1959. 9 figs., 2 tables, 8 refs. In Japanese; English summary p. 667. **DWB, DLC**—At the 70°E meridian of the Indian Ocean, the subtropical high of Jan. 1959 was stronger than Jan. 1958 and the low pressure region around the Antarctica lay southwards from normal. In Jan. 1959, the meridional circulation prevailed in the area from the South Atlantic Ocean to the South Indian Ocean. Some lows in mature stage directly approached the Shōwa Base and a bad weather persisted around the Sōya. From the end of Jan. the general circulation pattern changed to a zonal type. A low pressure region shifted north between 50–65°S, and the weather conditions around the Sōya and the Shōwa Base turned good. *Subject Headings:* **1. Meridional circulation 2. Zonal circulation 3. Antarctica 4. South Atlantic Ocean 5. South Indian Ocean.**—*Author's abstract.*

ATMOSPHERIC DISTURBANCES (551.515)

See also: **Handbook of instructions for Tornado Warning Radar Trailer**, 12.5–16; **Notes on Antarctic met.** (Prudhomme), 12.5–33; **Oceanog. conditions, N. Pacific** (Sugiura), 12.5–164; **Antarctic divergence and whale feeding grounds** (Beklemishev), 12.5–167; **Planetary frontal zones, N. and S. Hemispheres** (Pogosian), 12.5–218; **Tornadoes, Jan. 21, 1959** (Dickson), 12.5–222; **Total ozone and middle stratosphere in winter and spring, Arctic and sub-Arctic** (Godson), 12.5–255; **Gust velocity data for use in missile studies** (Vaughan), 12.5–304; **Suppression of thundercloud occurrence by volcanic eruptions, Japan** (Komabayasi), 12.5–334; **Funnel cloud, Chester** (Hoddinott), 12.5–344; **Air masses and weather types, Rhone Valley** (Blanchet), 12.5–398.

12.5–272 551.513.1(267) 551.506.5(267)

Usmanov, R. F., **Vertikal'nyĭ nazrez atmosfery nad Indiĭskim okeanom.** [Vertical cross section of the atmosphere over the Indian Ocean.] *Meteorologiia i Gidrologiia*, Leningrad, No. 4:24–28, April 1957. 2 figs., table. **DWB, DLC.** Transl. into English available for reference. **DWB** (M10.5 U86ve)—Some of the meteorological observations and the synoptic conditions encountered by the "Ob" over the Indian Ocean on the course of its return voyage from the Antarctic are described. A meridional cross section of the atmosphere was begun on 13 May 1956 in Davis Sea and ended on 13 June 1956. Curves showing the variation of mean daily air and water temperature and atmospheric pressure over the Indian Ocean, the stratification of temperature and relative humidity for given radiosonde altitudes at Mirny on the morning of 13 May and at the equator on 3 June 1956 and numerical data on the height of the principle isobaric surfaces and of the tropopause are presented. The temperature and weather on the Antarctic coast, the extent of the influences of Antarctic cold in the ocean (as far as Kerguelen Island), distribution of pressure fields with elevation, etc. are discussed in detail. *Subject Headings:* **1. Meridional cross sections 2. "Ob" Expedition, 1955–56 3. Indian Ocean.**—*I.L.D.*

12.5–273 551.513.2

Marchuk, G. I., **Godovoĭ khod indeksa tsirkuliatsiĭ.** [Annual variations in circulation index.] *Akademiia Nauk SSSR. Institut Fiziki Atmosfery, Trudy*, No. 2:114–118, **1958.** 5 refs., 13 eqs. **DLC** (Slavic)—On the basis of E. N. Blinova's and G. I. Marchuk's **Theory of the annual variation of the purely zonal circulation** (*Akad. Nauk SSSR, Institut Fiziki Atmosfery, Trudy*, No. 2, 114–118, **1958;** *see* 11.11–140, Nov. 1960, *Met. Abs.*) the author develops a formula for the annual variation of the index of the atmospheric circulation; in particular a double maximum of the index which is manifested emperically during the spring is obtained theoretically. The formula for the mean circulation index of the atmosphere, namely $\frac{\alpha}{co} = \frac{R}{\alpha_0^2\omega^2 4f\sigma T^3 \sin 2\theta} \frac{\partial}{\partial\theta}\int_0^1 E(\theta,x,l)\alpha x$ and the formula for the index of circulation arranged for the moderate latitudes of the atmosphere

$$E = 0.0023 \cos \Omega t - 0.0053 \sin \Omega t + 0.0009 \cos 2\Omega t + 0.0018 \sin 2\Omega t$$

are derived. A table giving deviations of the mean index of the circulation from the mean values is presented. *Subject Heading:* **1. Circulation indexes.**—*I.L.D. and Editor's abstract.*

12.5–274 551.513.2:551.524.33(98,99)

*Pogosian, Khoren Petrovich, **Seasonal peculiarities of the temperature and atmospheric circulation regimes in the Arctic and Antarctic.** *World Meteorological Organization, WMO* [*Publication*] No. 90.TP.37; Technical Note, No. 28, **1959.** 19 p. 3 figs., 6 tables, 11 refs. English, French, Russian and Spanish summaries preceding the text. **DWB** (M(06) W927p)—The similarities and differences in the meteorological conditions in the extreme latitudes of the two hemispheres are demonstrated by a comparison of the temperatures, winds and other parameters of the Arctic and Antarctic. The common features are governed by the seasonal radiation conditions and the differences by the character of the underlying surface, on which the formation of the tropospheric temperature field depends. This explains the greater intensity of the inter-latitude exchanges of air between the middle latitudes and the central areas of the Arctic. It also explains the heat advection towards the North Pole area, and the comparatively weak exchange of air in the Antarctic and heat advection towards the central areas of Antarctica. *Subject Headings:* **1. Atmospheric circulation regimes, Arctic 2. Atmospheric circulation regimes, Antarctic 3. Arctic 4. Antarctica.**—*Author's abstract.*

12.5–275 551.515.11:551.43(237)

McClain, E. Paul (*Univ. Chicago*), **Some effects of the Western Cordillera of North America on cyclonic activity.** *Journal of Meteorology*, Boston, 17(2):104–115, April **1960.** 6 figs., 3 tables, 19 refs., 3 eqs. **DWB, DLC**—Some effects of the western mountain complex of North America on cyclones are investigated from the standpoint of how the vorticity tendency field might be influenced by orographically-induced vertical motion and divergence. A detailed case study is presented which includes computations of terms in the vorticity tendency equation during a lee cyclogenesis. The local increases in low-level vorticity which occurred during formation of the lee trough and cyclone were primarily due to horizontal convergence, while the horizontal and vertical advection of vorticity opposed the increases; the contribution of the tipping term was generally negligible. The study also provides evidence that orographic effects are insufficient to explain the genesis of major cyclonic storms. *Subject Headings:* **1. Orographic effects on cyclones 2. Cyclogenesis 3. Western Cordillera, North America.**—*Author's abstract.*

12.5–276 551.515.13/23:551.542.1

Adámy, Erika (Koflanovits), **Talajközeli ciklonok áthelyeződésére vonatkozó vizsgálatok.** [Investigations of the displacement of surface cyclones.] *Időjárás*, Budapest, 63(5):310–313, Sept./Oct. **1959.** 4 refs., 2 eqs. **DLC**—The study attempts to give information on the research and its results regarding the expected displacement of the velocity and direction of the pressure formations in the frontal systems. The author describes recent methods developed in this field and refers to the observations made by Leonov, Ponomarenko and Mercalov. The conclusion indicates the need for accurate calculation of temperature advection and the

main currents to be able to investigate the displacement of surface cyclones. *Subject Headings:* **1. Cyclone displacement 2. Frontal systems 3. Temperature advection 4. Pressure formations.**—*E.K.*

12.5–277 551.515.2:551.577.61(267)(691)

§Chaussard, A. and Laplace, L., **Les perturbations dans le Sud-Ouest de l'Océan Indien, saison chaude 1958–1959.** [The disturbances in the southwest Indian Ocean, hot season 1958–1959.] *La Météorologie*, Paris Ser. 4, No. 56:323–366, Oct./Dec. **1959.** charts and diagrams, table. French, English and Spanish summaries p. 323. **DWB**—Madagascar is affected by meteorological influence from two centers of action; the zone of low intertropical pressures, of which the axis is submitted to a seasonal translation, and the semi-permanent cell of high oceanic pressures, of which the medium position is situated in the South of the Mascareignes Archipelago. The hot season 1958–1959 was characterized in the southwest of the Indian Ocean by an important cyclonic activity. Three tropical depressions and seven tropical cyclones which evolved in the vicinity of Madagascar or crosses the Island, were observed. In general these cyclones have their origin on the sea over the intertropical convergence zone or over a pre-existent depression. The authors comment on the pluviometry of the various months of the hot season and analyze various disturbances which came over Madagascar during this season. A chart gives the paths of the disturbances from tropical origin and the authors reproduce different synoptic charts of barograms and anemograms in order to show the evolution of the exceptional cyclone which came over the Island at the end of March. The amount of rainfall in Madagascar, which is about normal at the beginning of the Southern Summer, strongly exceeds in March 1959. The amount of thunderous rainfall in the warm season generally remains lower than average. On the other hand, rainfall occasioned by tropical disturbances are especially plenty during March. Considerable damage to many districts of Madagascar is more due to the rivers changing into torrents than from tempestuous winds connected with hurricanes. *Subject Headings:* **1. Cyclonic activity 2. Cyclonic tracks 3. Cyclonic precipitation 4. Indian Ocean 5. Madagascar.**—*A.V.*

12.5–278 551.515.21

Uwai, K., **Development of tropical disturbance (On atmospheric disturbances in low latitudes, Pt. 5.)** *Journal of Meteorological Research*, Tokyo, 11(6): 491–501, June **1959.** 3 figs., 10 refs., 47 eqs. In Japanese; English summary p. 491. **DWB, DLC**—The author discussed the mechanism of the deepening of tropical disturbance into a tropical storm in immature stage and the further development into a severe storm in mature stage from the theory of instability of two-layer fluid motion. He obtained the following results: the atmospheric disturbance in the upper troposphere above 500 mb level becomes unstable in case of warm trough with a small absolute vorticity or in case of cold trough with a large local polytropic temp. gradient. And the convergence flow breaks out into the central region of disturbance as the consequence of instability. Then the vertical motion grows upward and downward above and under the unstable layer respectively. Then the boundary layer near 300 mb level lowers locally by downward motion in upper layer and reaches the ground and the vertical circulation becomes as shown in Fig. 2(b). *Subject Heading:* **1. Tropical storm formation.**—*Author's abstract.*

12.5–279 551.515.23:551.509.318

Matano, H. (*Met. Res. Ins., Kyoto Univ.*), **A synoptic study of the formation of the severe typhoon over the tropical ocean.** *Meteorological Society of Japan, Tokyo, Journal*, Ser. 2, 35(2):117–127, April **1957.** 9 figs., 8 tables, 2 refs., 3 eqs. **DWB, DLC**—The present paper deals with a synoptic study of the formation of severe typhoons over the tropical ocean, based upon NAMEKAWA and AOKI's theory of main and secondary typhoons (published, 1954). It deals with typical cases of seven typhoons for the period of 1951–1956, and confirms the supposition for the formation of secondary typhoons. The confirmed results presented in figs. and tables indicate that the secondary typhoon is formed as the main typhoon passes the edge of the warm ocean current in the daytime through convection process, which occurred in the air column surrounded by the strong cyclone winds of the main typhoon, and that the radius of

the inner core of the secondary typhoon is not over 50 km when it is formed. *Subject Headings:* **1. Typhoon "Harriet," 1956 2. Typhoon "Ruth," 1951 3. Typhoon development 4. Synoptic conditions for typhoons.**—*K.C.*

12.5–280 551.515.71:551.555.3

Burman, E. A., **K teorii antitsikonal'nykh fenov.** [Contribution to a theory of anticyclonic föhn.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 3: 414–418, March **1958.** 3 tables, 2 refs., 11 eqs. **DWB, DLC.** Transl. into English in the corresponding number of its Bulletin of the *Academy of Sciences, U.S.S.R., Geophysics Series.* **DLC**—Föhn associated with the descent and spread of air down slopes during an anticyclone is termed anticyclonic föhn and it differs from the classical and free föhn types quantitatively rather than qualitatively. The author briefly compares the three types of föhn and analyzes the thermal processes of föhn, not by considering the state of individual particles, which involves the variation of the parameters of the atmosphere participating in the pseudo-adiabatic process but rather the local variation of atmospheric temperature and humidity at the stations affected by anticyclonic föhn. The derived formula for computing local change of relative humidity at station level $\frac{\partial f}{\partial t}=\omega\left[\frac{A}{Q(\tau)}\cdot 10^{-dz}+\frac{Be}{10^{(a\theta,b\theta)}(b+\theta)^2}\right](\gamma_a-\gamma)$ shows that the sign of change of relative humidity coincides with the sign of vertical velocity, i.e. the drop of relative humidity is observed only during the initial air motion (it is assumed that $\gamma<\gamma_a$), and that the effect of temperature is greater, the lower the air temp. Data are presented showing the magnitude of the temperature effect as a function of the temperature of the background and that the greatest variation in relative humidity in an anticyclonic föhn has a convective effect and computations of the convective and temperature effect and variation of the latter for a specific weather situation involving an anticyclone, clear weather and calm. The rate of fall of relative humidity depends upon the velocity of air subsidence. Föhn effect is more pronounced in winter than in summer. During positive gradients the fall of relative humidity increases with height. Temperature plays an insignificant role in the variation of relative humidity, hence even the occurrence of a "cold föhn" cannot interrupt a considerable drop in relative humidity under the influence of convection. *Subject Headings:* **1. Anticyclonic föhn theories 2. Föhn theories.**—*I.L.D.*

12.5–281 551.501.81 551.515.8:551.577(744

Cox, Myron K. (*Mass. Inst. Tech.*), **The distribution and variability of cold-front precipitation.** *American Meteorological Society, Bulletin*, 40(9):477–480, Sept. **1959.** 4 tables, 7 refs. **DWB, DLC**—Radar data are used to investigate winter-time cold-front precipitation patterns in the vicinity of Cambridge, Mass. No significant correlation was found to exist between the extent of precipitation as indicated by radar-scope coverage and selected synoptic parameters with the exception of the Instability Index which proved to be significant at the 5% level. Further comparison is made between the average precipitation amounts as indicated by the climatological network of rain gauges and the same synoptic parameters. Again, a significant correlation was found to exist only for the Instability Index. *Subject Headings:* **1. Cold front precipitation patterns 2. Radar observation of precipitation 3. Instability Index 4. Cambridge, Mass.**—*Author's abstract.*

12.5–282 551.515.8:551.556.8:551.461.2:532.59

Yamagata, T., **On the relation between sea waves and surface wind speed: on the variations of sea surface condition at Tango during the passage of front in 1953.** *Journal of Meteorological Research*, Tokyo, 11(7):614–622, July 1959. 11 figs., table, 9 refs. In Japanese English summary p. 614. **DWB, DLC**—The author examined the variations of sea surface condition during the passage of front or some atmospheric disturbances at "Tango," an ocean weather station at 29N, 135E, on the basis of observational data for 1953. The variations of sea surface condition were classified into four types against variation of wind speed as follows: (1) increases of both wind speed and wave height associated with the passage of front; (2) decreases of both wind speed and wave height associated with the passage of front; (3) increase o

wind speed but no variation in wave height associated with the passage of front; (4) same as type (1), but for the case associated with the passage of some atmospheric disturbances rather than front. Moreover, the relationship between wave steepness and wave age for these four types were compared with the results from Sverdrup-Munk's theory, and as the result it was shown that the steepness at Tango was in most cases smaller than the theoretical values for the same wave age. *Subject Headings:* **1. Frontal effects on sea surface 2. Wind-wave relationships 3. Sea surface conditions 4. Ocean Weather Station "Tango."**—*Author's abstract.*

12.5–283 551.515.83(265.4):551.553.8(52)

Ohtaki, T., **On the strong southwest wind in the southwest Kanto district.** *Journal of Meteorological Research*, Tokyo, 11(10):859–865, **1959.** 8 figs., 7 refs. In Japanese; English summary p. 859. **DWB, DLC**—The southern Kanto district frequently experiences a strong southwest wind when a cyclone is passing over the Japan Sea during winter and spring. As an example, the strong wind which occurred on April 14, 1958 was analyzed. By means of autographic records, hourly surface maps were drawn and compared with the analysis of upper surfaces. The results are as follows: (1) the area, where the strong southwest wind occurred was identified with the place estimated by extrapolation of the movement of the cold front, which decayed in the Izu-Peninsula; (2) the strong wind was observed below 850 mb surface. We can well explain various phenomena in this case as the result of the strong southwest wind with high temperature and low humidity which blew down from about 850 mb to the surface. *Subject Headings:* **1. Strong wind analysis 2. Cyclone-cold air mass relationships 3. Kanto District, Japan.**—*Author's abstract.*

RADIATION AND TEMPERATURE

RADIATION (551.521)

See also: **Radiation balance, Scott Base** (Thompson, Macdonald), 12.5–32; **Temp. control of satellite package** (Heller), 12.5–61; **Lyman α experiment for Vanguard satellite** (Chubb et al.), 12.5–62; **Thermal problems at low orbital altitudes** (Wing), 12.5–63; **Conversion of solar power** (Schlichtig, Morris), 12.5–89; **Positional fluctuations of solar radio sources on 200 mc/s** (Maltby), 12.5–114; **Assoc. between solar radio bursts at metre and centimetre wavelengths** (Neylan), 12.5–115; **Geomag. measures for time-variations of solar corpuscular radiation** (Bartels), 12.5–137; **Thermal balance, N. Atlantic** (Strokina), 12.5–153; **Use of radiation balance meters for heat economy investigations** (Frankenberger), 12.5–209; **Pressure effects on response of thermopile radiant energy detectors** (Karoli et al.), 12.5–210; **Vertical distribution of ozone from Umkehr obs., Canada** (Mateer, Godson), 12.5–256; **Cooling power and thermal radiation, Baltic Sea Coast** (Grimm), 12.5–392.

12.5–284 551.521:551.581

*Collmann, Wolfgang (*Hamburg*), **Verbesserte Idealwerte der Globalstrahlung mit einer Anwendung auf das Strahlungsklima von Hamburg und Lissabon.** [Improved standard values of the global radiation with an application to the radiation-climate of Hamburg and Lisbon.] *Annalen der Meteorologie*, Hamburg, 8(5/6):179–186, **1958.** 2 figs., 5 tables, 13 refs. **DWB, DLC**—Hourly published sky radiation values by Deirmendjian and Sekera (*Tellus* 6, 382:1954) based upon the exact theory of Chandraseklov deviate considerably from the Bernhardt values of approximate sky radiation for large solar zenith distances. In order to render the ideal values, reference values of global radiation approximating as clearly as possible the conditions of a Rayleigh atmosphere, the author repeated the calculation of ideal values of global radiation. For calculating the ideal values of global radiation as a function of solar elevation the author used F. S. Johnson's values of extraterrestrial solar radiation which gave a subzonal solar constant (from 0.29μ) of 1.995 cal/cm^2 min; the extinction coefficients of the Rayleigh atmosphere given in the new edition of the Linke's Meteorologische Taschenbuch, and the Deirmendjian and Sekera values of sky radiation, the improved ideal values of direct solar radiation as a function of air mass are presented in a table. With the aid of tables of Melankovitch and the approximation formula $G = J_0 \cdot \cos z \cdot [c + (1-c) \cdot q^M]$ the daily totals of ideal values of global radiation in cal/cm^2/day for $J_0 = 1.995$ cal/cm^2 min were computed and

presented in a table. Ideal values of global radiation were computed for Hamburg and Lisbon and are used to characterize most exactly the radiation climate of these localities. *Subject Headings:* **1. Global radiation 2. Radiation climate 3. Hamburg, Germany 4. Lisbon, Portugal.**—*I.L.D.*

12.5–285 551.521:551.511

Möller, Fritz (*Mainz*), **Radiation and meteorology.** Presented at the meeting of the Radiation Commission of IAMAP, Oxford, July 20, **1959.** (9 p.) 5 figs., 16 refs. Reproduction of typescript. **DWB** (M21 M693ra)—A discussion of the relationship between radiation and dynamic meteorology. A historical survey is made of the progress in radiation research and in dynamic meteorology and their increasing inter-dependence. Radiation must play a very important role in the dynamics of the atmosphere and in the weather prediction and in its theory, since the radiation balance represents the motor which keeps the atmosphere in motion. The radiation influences on the temperature field, on the motion processes, on cloudiness and precipitation are discussed. *Subject Heading:* **1. Radiation-dynamic meteorology relationships.**—*I.S.*

12.5–286 551.521.12(234.3,234.41)

*Bossolasco, Mario, **Ergebnisse der Strahlungsmessungen auf den Westalpen und auf den Apenninden.** [Results of radiation measurements in the western Alps and the Apennines.] *Germany. Deutscher Wetterdienst, Berichte*, 8(54):267–269, **1959.** 2 figs., 2 tables, 3 refs. German, English and French summaries p. 267. **DWB, DLC**—Preliminary report on solar-radiation measurements made at Sauze d'Oulx (W-Alps) and at Monte Capellino (Apennines) during 1957–58. *Subject Headings:* **1. Solar radiation measurements 2. Western Alps 3. Apennines.**—*Author's abstract.*

12.5–287 551.521.14:535.43

Malkevich, M. S., **Vliianie gorizontal'nykh izmeneniĭ al'bedo podstilaiushcheĭ poverkhnosti na rasseianie sveta v odnorodnoĭ atmosfere.** [Influence of horizontal albedo variations of the underlying surface on the scattering of light in a homogeneous atmosphere.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 8:995–1005, **1958.** 11 figs., 7 tables, 8 refs., 12 eqs. **DLC.** Transl. into English in the corresponding number of its Bulletin of the *Academy of Sciences, USSR, Geophysics Series.* **DLC**—A method developed by the author (*Akad. Nauk SSSR, Ser. Geofiz., Izvestiia*, No. 5, 1957; *see* 9.10–192, Oct. 1958, *Met. Abs.*) for taking into account the inhomogeneities of an underlying surface on the theory of light scattering in turbid media is applied to a homogeneous isotropic scattering atmosphere. The intensity and flux of radiation on all surfaces and also the variation of the function of source and of total albedo with height over different parts of an underlying surface are computed for an albedo periodically varying along one of the horizontal coordinates. From the assumptions that the indices of scattering are spherical that parallel rays of solar radiation infringe upon the outer boundary of the atmosphere and that the underlying surface scatters according to the law of Lambert-Bauguer there obtained a radiational field of a homogeneous atmosphere under the condition that the albedo of the underlying surface varies according to the law $q(\zeta) = q_0 + q_i \sin\zeta$, where ζ-non-dimensional horizontal coordinate, q_0, q_1—some number $(q_0 + q_1 \leqslant 1;\ q_0 - q_1 \geqslant 0)$. Equations for the function of the source $K(t_1\zeta)$ and for ascending and descending radiation $I^{(1)}$ and $I^{(2)}$ are developed and the solution of this equation is carried out. The determination of the supplementary functions and constants, the calculation of function $K(t_1\zeta)$, the flux of scattered radiation and of the distribution of total albedo with height are presented with the aid of equation, and relevant constants and the results are presented in tables and graphs. *Subject Headings:* **1. Albedo effects on diffuse radiation 2. Atmospheric scattering.**—*I.L.D.*

12.5–288 551.521.14(285/439.1)

Tárkányi, Zsuzsanna, **Balatoni albedómérések.** [Lake Balaton albedo measurements.] *Időjárás*, Budapest, 63(2):100–102, March/April, **1959.** 3 figs., 4 refs., eq. **DLC**—Albedo, a quotient of reflected and incidenced global rays, is one of the components of radiation balance. The measurements were taken for the first time in Hungary under entirely natural conditions.

They were taken at 5 stations of the eastern region of Lake Balaton, above grass surface in 1958, using the Moll-Gorczyski thermoelectric instrument. The restricted quantity of thermoheads made it necessary to determine the reflected radiation by turning the instrument downward and to compute the albedo by help of global radiation. 630 measurements were taken above green grass, 530 above dry grass, and 40 above water surface. The daily course, as illustrated, shows albedo's decline after sunrise; approximately 15% decrease from morning to a minimum at noon, followed by an increase in the afternoon. The daily curve is explained by the alteration of the spectral synthesis of the incidence-rays, caused by plants of chlorophyll content. Clouds, and shadows at arbored spots affect the daily curves, as illustrated on Balatonalmadi's diagram. The mean value of 19% for cloudy sky shows a difference of 2% from that one of 21% under clear sky. The mean values of albedo present 19% for green grass, and 21% for dry grass. The scattering amounts to 3–4 in average, 2–3 around noon, 5–6 in the mornings and in the evenings. Measurements above water were not enough to warrant exact results. The 12% albedo, corresponding with results of foreign research, indicates a more economical usage of radiation of water surface than of grass surface. The references list papers of previous research done in Hungary on related subjects. *Subject Headings:* **1. Albedo data 2. Lake Balaton, Hungary.**—*O.T.*

12.5–289 551.521.16:551.463:535.4(261)

Boden, B. P.; Kampa, E. M. and Snodgrass, J. M. (*all, Scripps Inst. Oceanog, Calif.*), **Underwater daylight measurements in the Bay of Biscay.** *Marine Biological Association of the United Kingdom, Journal*, 39(2):227–238, June **1960.** 8 figs., 2 tables, 10 refs. **DLC**—A telerecording bathyphotometer embodying a multiplier phototube is described and the circuitry is illustrated. Measurements were made of the penetration and spectral characteristics of daylight to a depth of 400 m in the Bay of Biscay. It is suggested that the rapid attenuation of light in the upper 100 m was due in part to biological matter associated with a sharp thermocline. A change in the weather is presumed to have caused a change in the depth of the thermocline and this is reflected in a change in attenuation coefficients. *Subject Headings:* **1. Thermocline 2. Bathyphotometers 3. Light penetration in sea 4. Bay of Biscay.**—*Authors' summary.*

12.5–290 551.521.18:551.575.1

Kurnick, S. W.; Zitter, R. N. and Williams, D. B. (*all, Chicago Midway Lab., Univ. of Chicago*), **Attenuation of infrared radiation by fogs.** *Optical Society of America, Journal*, 50(6):578–583, June **1960.** 9 figs., 13 foot-refs., 12 eqs. **DWB, DLC**—Optical transmission has been measured in fogs for wavelengths from 1–11u. The results, together with the data of Arnulf, Bricard, Curé, and Veret, are analyzed under the assumption that particle sizes in natural aerosols follow the distribution law proposed by Junge: $n(r) = Cr^{-p}$, where $n(r)dr$ is the number of particles per cmf with radii between r and $r+dr$, and C and p are some constants. The dependence of transmission on wavelength in fogs is of several forms, yet the theory accounts satisfactorily for each of them. Particle size measurements, when made, were in accord with the distribution law, and the values of p so obtained agree with the values inferred from optical transmission measurements. *Subject Headings:* **1. Infrared radiation through fog 2. Light transmission through fog.**—*Authors' abstract.*

12.5–291 551.521.18:551.524:546.264:535.33

Sasamori, Takashi (*Tohoku Univ.*), **The temperature effect on the absorption of 15 microns carbon-dioxide band.** *Tohoku Univ., Science Reports, 5th Ser., Geophysics*, 11(3):149–161, Dec. **1959.** 5 figs., 4 tables, 17 refs., 28 eqs. **DWB, DLC**—Absorptions of a parallel beam of radiation by the 15μ carbon-dioxide band were calculated for different temperature conditions of the absorbing gas. With use of the results the temperature effect due to the change of the line intensity in the band was examined. It is shown that for short path lengths the temperature effect is governed mainly by the change of the relatively strong lines in the band and that the changes of the weaker line in the band become important with increasing path length. In the spectral region distant from band center, because of the rapid change of the line intensity, the effect of the temperature change is as appreciable as the pressure effect. For the interval

14–16μ the results are compared with those of KAPLAN (1950), showing that the present results differ from those of KAPLAN appreciably at low pressure and temperature conditions. *Subject Headings:* **1. Carbon dioxide absorption bands 2. Temperature effects on carbon dioxide absorption bands.**—*Author's abstract.*

TEMPERATURE (551.524)

See also: **Upper air temp. data, Central Arctic Basin** (Belmont), 12.5-26; **Min. temp. determination, Antarctica** (Dobryshman), 12.5–31; **Notes on Antarctic met.** (Prudhomme), 12.5–33; **Effects of adjusting night temps. on greenhouse roses** (Boodley, Seeley), 12.5–74; **Frost protection** (Peyer), 12.5-75; **Air temp. and humidity of cultivated fields** (Muminov), 12.5–77; **Heat balance in deciduous forest** (Rauner), 12.5–79; **Heat balance of forest** (Rauner), 12.5-80; **Microclim. measurements in forests near Sarajevo** (Handžić), 12.5–81; **Thermal balance, N. Atlantic** (Strokina), 12.5–153; **Glaciological investigations, NW Greenland** (Nobles), 12.5–173; **Temp. effects on ground water levels** (Meyer), 12.5–185; **Airborne measurements of temp.** (Helliwell), 12.5–191; **Low level temp. measurements, Charcot** (Garcia), 12.5–204; **Frost intensity, Leningrad region** (Smekalova), 12.5–226; **Probability forecasts of temp. anomalies, Potsdam** (Teich), 12.4–227; **Minimum temp. forecasting for fruit growers, South Australia** (Veitch), 12.5–228; **Forecast for winter 1958/1959, Yugoslavia** (Manohin), 12.5–232; **Statistical studies of inversions, Vienna** (Steinhauser), 12.5–251; **Total ozone and middle stratosphere, Arctic and sub-Arctic** (Godson), 12.5–255; **Control of inversion height by surface heating** (Ball), 12.5–263; **Temp. and circulation regimes, Arctic and Antarctic** (Pogosian), 12.5-274; **Estimating heating degree days** (McGrew), 12.5-294; **Frequency distribution of wind vectors and air density, N. Hemisphere, 12.5–315; Fog influence on temp.** (Manohín), 12.5–338; **Effective temps., *U.S.S.R.*** (Milevskiĭ), 12.5–387; **Spring transition of air temps., N.E. U.S.S.R.** (Levin, Mischikov), 12.5–396; **"Kernlose" winter, Antarctica** (Wexler), 12.5–397; **NASA reactor facility hazards summary,** 12.5–399.

12.5–292 551.524.31:551.588.7

Berg, Hellmut, **Nächtlicher Temperaturanstieg am Rande einer Grosstadt.** [Nocturnal temperature rises around a large city.] *Wetter und Leben*, Vienna, 11(1):9–11, **1959.** 2 figs., 3 refs. **DLC**—The problem of the occurrence of a nocturnal wind was investigated by means of a series of temperature and wind measurements at 2 met. taken throughout a single night on the outskirts of Cologne. At no point was there observable a flow of cooler air from the outskirts into the city. Instead the temperature rose at all stations in the open country from 00.00 hours to 03.00 hours and then began to drop toward sunrise. The rise in temperature was accompanied by an increase in wind velocity. The low wind velocities up to midnight allowed the air masses flowing from the city to cool by 3–3.5°C; but the increased wind velocity did not allow sufficient time for the air to cool as it reached the outskirts. This temperature rise is to be attributed to the incursion of warm air from the city. *Subject Headings:* **1. Nocturnal temperature rise 2. Nocturnal wind velocities 3. Urban temperatures 4. Cologne, Germany.**—*I.L.D.*

12.5–293 551.511:551.524.35(439.1)

Aujeszky, László, **A melegadvekció kivételesen erős esetei az 1958. évben Budapesten.** [Cases of particularly strong thermal advection in Budapest in 1958.] *Időjárás*, Budapest, 63(4):233–235, July/Aug. **1959.** 5 tables. **DLC**—A particularly strong thermal advection in Budapest, Feb. 12–16, 1958, with anomalies of +10°C as compared with only 11 days of such anomaly during the previous 20 years, is analyzed. The temperatures of the four days of higher anomaly during this period; the mean temperatures of the 500/1000 mb level; the other days of surpassing +10°C in 1958; the survey of cases reaching 10° of positive or negative anomaly by seasons during 1938–58; the distribution of at least 10° of anomaly by seasons, and monthly from Nov. to Feb. are presented in tables. The comparison of the above data show not only the particular character of the heat wave of Feb. for 1957/58 but it shows also the particular temperature variations of the other parts of that year. *Subject Headings:* **1. Advection of heat 2. Temperature anomalies 3. Budapest, Hungary.**—*O.T.*

12.5–294 551.501.45:551.524.36:519.241.6

McGraw, Russel G. (*Omaha, Nebraska*) **Eine Methode zur Abschätzung der mittleren monatlichen Zahl der Heizgradtage.** [A method of estimating the mean monthly number of heating degree days.] *Meteorologische Rundschau*, Berlin, 12(4):128–129, July/Aug. 1959. fig., table, ref., 2 eqs. **DWB, DLC**—The author develops empirical curves for reading off the mean monthly number of heat degree days by using only the long period monthly mean of temperature. The monthly number of degree days is defined as: $DD=\sum_{j=1}^{n}(18.5-aj)$, where $a=T_m$=daily mean temperature for $T_m<18.5°C$ and $a=18.5°C$ for $T_m\geq 18.5°C$, n=number of days per month; the index j designates the summation of daily values of an individual month. The mean monthly number of degree days is then $\overline{DD}=\frac{1}{k}\sum_{i=1}^{k}\sum_{j=1}^{n}(18.5-aij)$, where k=the number of observations and i=summation of the number of values of an individual month over the number of years of observation. In case during the entire month $T_m<18.5°C$ then $\frac{i}{k}\sum_{i=1}^{k}\sum_{j=1}^{n}aij=\frac{1}{k}(nk\bar{T})$, where $\bar{T}$=mean temperature of the given month; and $\overline{DD}=n(18.5-\bar{T})$. An empirical relationship can be established between the mean monthly temperatures and the mean monthly degree days by constructing 5 and 10 year mean curves of 20 U. S. A. stations and 9 stations in the so-called "European Theater." These curves are presented and compared with exactly compiled mean heat degree curves computed from frequency distributions of daily temperatures of experimental stations. Also σ—curves computed according to an equation which allows the mean monthly number of heat degree days to be computed from the monthly mean and the scattering of the temperature are presented. This equation is $\overline{DD}=n\left[(18.5-T)P(T<18.5)+\sigma\phi\left(\frac{18.5-\bar{T}}{\sigma}\right)\right]$, where P=probable integral for $T<18.5°C$ and φ=the Gaussian normal distribution for $T=18.5°$. The determination of the monthly mean degree number can be determined with satisfactory exactness also for such localities for which neither scattering values nor frequency stations of daily temperature mean that only long period monthly means of temperature are available. *Subject Headings:* **1. Heating degree days 2. Monthly mean temperature data 3. Statistical methods in computation.**—*I.L.D.*

12.5–295 551.524.37(477.9)

Burtsev, D. A., **Neobychnye zamorozki v Krymu.** [Unusual early frosts in the Crimea.] *Meteorologiia i Gidrologiia*, Leningrad, No. 3:40, March **1959. DWB, DLC**—During June 7–9, 1958, the Crimea experienced a sharp cooling. The midday air temperature of June 7 dropped 10–12°C from that of the previous midday temperature. The following day cooling intensified and on the night of June 8 frosts were observed in the mountains at 900–1000, and also in the central steppe and foothill regions; on the night of June 9 the temperature fell to −0.2°C in Voronkakh (steppe); in Belogorsk (foothills) it fell to 0°C; and in Ai-Petri to −2°C. In various districts the frosts caused damage to the leaves and shoots of maize and the leaves of vines. *Subject Headings:* **1. Early frosts 2. Crimea.**—*I.L.D.*

12.5–296 551.524.73:551.510.528(966.1)

Jordan, C. L. (*Florida State Univ.*), **Abnormally cold tropopause temperatures in the equatorial Pacific.** *Monthly Weather Review*, Wash., D. C., 88(4):151–154, April **1960.** 4 figs., table, 3 refs. **DWB, DLC**—Radiosonde observations made at Kusaie in the eastern Caroline Islands on May 15–16, 1956, reported tropopause temperatures colder than −86°C. in several instances with an extreme value of −96°C. The series of soundings are examined and compared with those made at other stations in the equatorial Pacific area. *Subject Headings:* **1. Radiosonde data 2. Tropopause temperatures 3. Caroline Islands 4. Equatorial Pacific.** —*Author's abstract.*

SOIL TEMPERATURE (551.525)

See: **Soil thermometers** (Henning), 12.5–211.

WATER TEMPERATURE (551.526)

See also: **Thermal balance** (Strokina), 12.5-153; **Thermistor thermometer for estuarine investigation** (Srivastava, Raman), 12.5–154; **Forecast of water temp. south of Hokkaido** (Sugiura), 12.5–161; **Melting of pack-ice field** (Akagawa), 12.5–171; **Charts of mean surface water temp., Sea of Japan,** 12.5–372.

12.5–297 551.526.6:551.464:551.326.7

†Akagawa, M., **On the relation between oceanographical conditions and sea ice in the Okhotsk Sea.** *Hakodate, Japan. Marine Observatory, Bulletin, No. 5,* [Contribution No. 13], Dec. **1958.** Reprint from unidentified source p. 91–104. 14 p. 9 figs., table, 36 refs. In Japanese. English summary p. 91. **DWB**—The studies on the relation between oceanographical conditions and sea ice have been made by some authors. But clear relationship in this field has not been obtained. The present author examined this problem comparing the two in the Okhotsk Sea area in April 1951, 1956 and 1957; April is the end of drift ice season in the southern Okhotsk coast of Hokkaido. The principal results are as follows: (1) the annual variations of temp., chlorinity and dissolved oxygen in the Okhotsk surface cold water are either directly or indirectly related to the amounts of drift ice, which is represented by the periods of drift ice and distribution; (2) the distributional patterns of oceanographic elements are also locally related to the one of drift ice; (3) the distribution of drift ice, especially in the coastal sea area, seems to depend on the current system. *Subject Headings:* **1. Ice drift 2. Sea temperature variations 3. Chlorinity variations 4. Oxygen in sea water 5. Sea of Okhotsk.** —*Author's summary.*

12.5–298 551.526.6:551.465(265.4)

Hakodate, Japan. Marine Observatory, **Forecast of water temp. in the sea east of Tohoku District in midsummer, 1957.** Its *Bulletin,* No. 5, [Contribution No. 6], Dec. **1958.** Reprint from unidentified source p. 49–54. 6 p. 10 figs., 3 tables. In Japanese; English summary p. 49. **DWB**—Some interrelations are recognized between the following sea conditions in early spring and the water temp. in midsummer: 1) southward endpoint of the Oyashio coastal branch; 2) the longitude of the Kuroshio main stream on the line east of Shioyazaki, and 3) cold area in the 100 m layer temp. chart of 38∼42°N and 142∼145°E. These interrelations being used, it is forecast that the surface water temp. in the midsummer of 1957 may be normal. *Subject Headings:* **1. Water temperature forecasting 2. Sea current effects 3. Oyashio current 4. Kuroshio current 5. North Pacific.**—*Author's abstract.*

PRESSURE AND WIND

PRSSSURE

See also: **Method of representing horizontal pressure force** (Sangster), 12.5 -189; **Pressure effects on response of thermopile radiant energy detectors** (Karoli et al.), 12.5-210; **Circulation at the 10 mb constant pressure surface over N. America** (Teweles et al.), 12.5 219; **Outbreak of southerly cyclones, Transbaikalia** (Bukhalova), 12.5 221; **Displacement of surface cyclones** (Adámy), 12.5–276; **Drawing wind field charts for oceans** (Sorkina), 12.5–307.

12.5–299 551.543(26):551.509.1

Shinners, Willard W. (*Marine Observations, U. S. W. B.*), **Pressure characteristics and change ($D_sV_s$app).** *Mariners Weather Log,* Wash., D. C., 3(6):224–225, Nov. **1959.** fig. **DWB**—A short note listing hints for the mate aboard ship concerning the reporting of pressure tendency and the amount of change from the barograph. Instructions are given for selecting the proper characteristics of change and a proper code figure. A graphic representation of

pressure characteristics and code is also given. *Subject Headings:* **1. Marine observers codes 2. Pressure variations over oceans.**—*I.S.*

12.5–300 551.543.1:517.512.2

Berg, Hellmut (*Köln*), **Eine vierstündige Welle im Tagesgang des Lufdruckes.** [A four-hour wave in the daily air-pressure trend.] *Meteorologische Rundschau*, Berlin, 12(6):176–189, Nov./Dec. **1959.** 9 figs., 2 tables, 2 eqs. 4 refs. German summary p. 176. **DWB, DLC**—The harmonic analysis of daily variation of atmospheric pressure at 100 stations in the United States and 52 other stations showed in Jan. 24-hour pressure wave whose amplitude reached a maximum of 0.1 mb. For the U. S., in particular, there was evident a dependence of the phase angle upon geographic longitude. Accordingly this 24-hour wave proceeds from east to west around the earth once in 24 hours. The amplitude has a maximum at approximately 35–40°N lat. and a second weaker maximum at 35°S lat. The amplitudes diminish towards the equator and the poles (minimum at approximately 10°S lat). The 4-hour pressure wave is not merely an accidental result of calculation. The possible thermal origin of this pressure wave, and the possibility that this wave is the result of a non-thermal oscillation in the form of peplopause waves, are considered and rejected. *Subject Headings:* **1. Diurnal pressure variations 2. Pressure waves 3. Harmonic analysis.**—*Trans. of author's summary & I.L.D.*

12.5–301 551.547.1(265/266)

Yoshida, Kozo and Tsuchiya, Mizuki (*both, Geophysical Inst., Tokyo Univ.*), **Note on the thermosteric anomaly.** *Oceanographical Society of Japan, Journal*, 13(4):127–129, Dec. **1957.** 2 figs., 2 refs., eqs. **DWB**—The simplified method for the computation of dynamic height anomaly proposed by MONTGOMERY and WOOSTER (1954) and by KLEIN (1955) is examined for about 250 stations over the North Pacific. The present study indicates that the integrated pressure terms for the dynamic height anomaly, surface over 1000 mb, can be evaluated in terms of temperature only at 600 m level with sufficient accuracy. The errors introduced by this replacement are found less than 1 dyn. cm for various areas of different water masses. *Subject Headings:* **1. Thermosteric anomaly 2. North Pacific.** —*Authors' abstract.*

12.5–302 551.547.5:551.511:551.576.1

Van Thullenar, C. F., **Pressure difference.** "Paper presented at First Conference on Cumulus Convection, Portsmouth, N. Hampshire, May 19–22, **1959.**" (9 p.) 2 figs., 3 refs., 5 eqs., Mimeo. **DWB** (M76 V272pr) —Considering an individual cumulus cloud as a single cellular mechanism it is found that the hydrostatic pressure difference between the cloud and its environment increases with elevation above the level of free convection. Near the 500 mb level the pressure difference may be more than 6 mbs. Higher pressure is within the active portion of the cloud and its magnitude increases with the degree of instability. The effect of this pressure difference leads to some interesting speculations concerning real pressure differences and the circulation within the cloud. *Subject Headings:* **1. Convective cloud thermodynamics 2. Cumulus cloud structure.**—*Author's abstract.*

TURBULENCE (551.551)

See also: **Dispersal of stack gases** (Strom et al.), 12.5–87; **N. Hemisphere winds aloft and their variations** (Williams), 12.5–96; **Airborne measurements of wind variation** (Helliwell), 12.5–191; **Computation of Deacon wind profile parameters** (Martin), 12.5–194; **Control of inversion height by surface heating** (Ball), 12.5–263; **Vertical exchange** (Frankenberger), 12.5–267; **Microturbulent vertical exchange of mass and heat** (Hollmann), 12.5–268; **Biomet. and displacement of air-borne insects** (Rainey), 12.5–389; **Atmos. electrical agitation** (Israël), 12.5–413.

12.5–303 551.551:551.511.6

Businger, J. A. (*Univ. of Wisc.*), **A generalization of the mixing-length concept.** *Journal of Meteorology*, Boston, 16(5):516–523, Oct. **1959.** 5 figs., 28 refs., 23 eqs. **DWB, DLC** A concept for the mixing length in diabatic conditions is introduced and elaborated. The basic idea is that convective energy has effect on the mixing length but not on the size of the largest

eddies. The theory developed on this concept of the mixing length for the diabatic wind profile gives satisfactory agreement with observations over a wide stability range. *Subject Headings:* **1. Mixing length 2. Diabatic wind profiles.**—*Author's abstract.*

12.5–304 551.551:551.515.4

*Vaughan, William W., **Analysis of discrete atmospheric gust velocity data for use in missile design and performance studies.** *U. S. Army Ballistic Missile Agency, Redstone Arsenal, Alabama, DA Technical Report,* 68-59, Nov. 20, **1959.** 35 p. 6 figs., 11 tables, 13 refs. **DWB** (M:623.4 U581an)—This report contains an analysis and summary of currently available data on discrete atmospheric gusts obtained from airplane measurements. The discrete gust velocity associated with the 99.86% probability of occurrence level for thunderstorm type turbulence is given as 12.5 m/sec based on gust data between 1.5 km and 14 km altitude. Nonthunderstorm associated gust velocities vary for the 99.86% level from 8 m/sec in the lower altitudes (1–2 km) to about 3 m/sec above 8 km. The importance of information on gust gradient distance in formulating statements on atmospheric turbulence, especially discrete gust measurements, is reviewed. Within the limits of available data, various cumulative percentage frequency distributions for gust shear (ratio of peak gust velocity to gust gradient distance) versus gust gradient distance are presented. The information presented is preliminary and should be treated as such until more complete and reliable data become available. *Subject Headings:* **1. Discrete gust velocities 2. Gust velocity data.**—*Author's abstract.*

12.5–305 551.551.2:551.43

Andreev, I. D., **Poryvistost' vetra vnutri chasovogo intervala.** [Wind gustiness within a time interval of 1 hour.] (In:Akademiia Nauk SSSR. Energeticheskii Institut, **Voprosy vetroenergetiki.** Moscow, **1959.** p. 5–10. 4 figs., 2 tables, 3 refs., 8 eqs.) **DWB** (M56.3 A3i3vo)—The dispersion of the distribution of relative deviations of wind velocity from their mean values are studied in different intervals of averages within one hour. These dispersions are related to the time of averaging the wind velocity and the roughness factor (Z_0), specific for the region in which the observations were carried out. Established relations permit computation of the coefficients of wind gustiness at different duration of the study. The results of the registration of wind velocity of air near the ground by means of a contact anemometer (Main Geophysical Observatory in the Kaltusha), are investigated. The recorded data were mathematically analysed and graphically coordinated. The values of the coefficients of the wind gustiness are tabulated from 2, 5 and 10 second intervals. Partial contradictions in the coefficient are related to nonuniform selection of the intervals, to the periods selected for the determination of mean wind velocity and also some contradictions are due to improper consideration of the physico-geographic and the roughness factors. *Subject Headings:* **1. Wind velocity distribution 2. Gustiness-wind velocity relationships 3. Orographic effects on winds.**—*N.P.S.*

12.5–306 551.551.25 551.554

*Trappenberg, Rüdiger, **Ein Beitrag zu den Windverhältnissen in den ersten 100 m Atmosphäre.** [Wind conditions in the first 100 m of the atmosphere.] *Germany. Deutscher Wetterdienst, Berichte,* 8(56), **1959.** 41 p. 42 tables, 22 refs., 7 eqs. German and English summaries p. 3. **DWB, DLC**—For determining the discharge of a chimney, above all the direction and the speed of wind have to be known in the atmospheric layer 100 m above the ground. Since information on this layer are hardly available, several series of observation have been carried out. The distribution of wind directions did not show any preference in direction. They are distributed in all cases much more uniform than with estimated frequency values or those determined by a scale of small dissolution. The variation of wind direction during one hour most frequently amounts to one point (1 point equals 11.25 degrees). Hours without a variation of the five minutes mean direction are an exception. The wind speed varies within the known limits. It has to be pointed out, however, that at any time at all stations calms above 50 m were less frequent than had been expected. The daily variation of the wind speed clearly shows the surface and the height-type of wind speed. The zone of transition between

both types is to be found at different heights and seems to be determined by the orography of the surroundings. The study of the wind profile reveals a turbulence zone near the ground, the height of which also depend on the orography. Over a large town the turbulence zone measures about 20 m, over plains still about 10 m. This layer is clearly distinguished from the higher layers, implying the existence of a second effective surface. The values of the meteorological coefficient n characterizing the wind profile, are very different. It is not possible, however, to extrapolate them either with respect to time or to place. The daily variation of n is always to be observed and independent from height. The maximum is found during night, the minimum about noon. Mean values of the exchange coefficient have been indicated. No conclusions have been drawn from these values, since the theory of their determination is based on untested assumptions only. Relations between the different meteorological factors studied in the paper could not be generalized. *Subject Headings:* **1. Low level wind measurement techniques 2. Vertical wind velocity distribution 3. Wind profile measurements.**—*Author's abstract.*

HORIZONTAL DISTRIBUTION (551.552) AND WIND VARIATIONS (551.553)

See: **Midsummer diurnal winds in S. Australia** (Clarke), 12.5-86; **Strong southwest wind, Kanto District** (Ohtaki), 12.5-283; **Max. wind speeds in various parts of jet stream** (Avvakumov), 12.5-317; **Chart of number of days with strong winds, European U.S.S.R.** (Sokhrina), 12.5-373.

12.5-307 551.552(26):912 551.556.8:551.465

Sorkina, A. I., **Postroenie kart vetrovykh poleĭ dlia moreĭ i okeanov.** [Drawing wind field charts for seas and oceans.] *Moscow. Gosudarstvennyĭ Okeanograficheskiĭ Institut, Trudy*, No. 44, 1958. 73 p. 17 figs., 22 tables, 39 refs. **DLC**—This is a monograph giving in detail methods of constructing charts of wind field and waves or drift currents over seas and oceans. The theory as well as practice is developed, based on synoptic and aerological data and laws of pressure and wind relations with height or at a given height over uniform or rough surfaces with varying energy budget. After discussing theoretical aspects, the accuracy of the empirical rules is treated graphically and in tables. Then examples are worked out from synoptic materials of several types for the Baltic, N. E. Atlantic, Sea of Japan, Caspian, North Sea, Gulf of Mexico, Arabian Sea, etc. Use in constructing wind-wave and current charts is also treated at some length with examples. Finally, monograms and tables are given for direct calculation of waves or currents from pressure data. *Subject Headings:* **1. Wind field chart construction 2. Wind field above the ocean.**—*M.R.*

12.5-308 551.552:551.43

Trubnikov, B. N., **Prostranstvennaia zadacha obtekaniia vozvyshennosti neogranichennym sverkhu vozdushnym potokom.** [A three-dimensional problem of an upwardly unbounded air current moving past an elevated place.] *Akademiia Nauk SSSR, Doklady*, 129(4):781-784, **1959.** 5 refs., 21 eqs. **DLC**—The problem of the flow of air currents around mountains is solved for an atmosphere of unbounded heights and elevations of any shape. Proceeding from the fundamental system of the hydrodynamic and thermodynamic equations of an ideal fluid in an adiabatic and stationary process and considering that the elevation introduces only small disturbances into the fundamental horizontal movement in the atmosphere, the author assumes that the solution can be presented in the form

$$u=\bar{u}+u' \qquad v=v' \qquad w=w' \qquad P=\bar{P}+P' \qquad \rho=\bar{\rho}+\rho' \qquad T=\bar{T}+T'$$

where $\bar{u}$ = vector, in the atmosphere, to infinity with the windward side of the elevation, and of constant magnitude, $\bar{P}$, $\bar{\rho}$, $\bar{T}$ pressure and temperature in the undisturbed principle current depending only on height z. The method of solution is presented and equations are derived describing the rise of the line of flow on the windward side long in advance of the elevation, the system of lee waves and the exponential disturbance of the lines of flow subsiding to infinity. *Subject Headings:* **1. Air flow over obstacles 2. Orographic effects.**—*I.L.D.*

VERTICAL DISTRIBUTION (551.554) AND SPECIAL WINDS (551.555)

See: **Heat balance in deciduous forest** (Rauner), 12.5-79; **Computation of Deacon wind profile parameters** (Martin), 12.5-194; **Aerosynoptic conditions, Golodnaya Steppe** (Romanov, Chanysheva), 12.5-225; **Vertical exchange** (Frankenberger), 12.5-267; **Theory of anticyclonic föhn** (Burman), 12.5-280; **Wind conditions in first 100 m** (Trappenberg), 12.5-306.

WIND EFFECTS (551.556)

See also: **Relation between sea waves and surface wind speed at O.W.S. "Tango"** (Yamagata), 12.5-282; **Wind field charts for oceans** (Sorkina), 12.5-307.

12.5–309 551.556:634.9

Gerashchenko, K. I. and Gerashchenko, O. A., **Sechenie stovla i napravlenie vetra.** [Cross-section of trees, as related to the direction of wind.] *Priroda*, Moscow, No. 1:114, Jan. **1960. DLC**—A very peculiar example of the adaptability of trees to specific conditions can be observed on streets lined with old and tall houses. In such conditions their cross-section have the form of an ellipse. This effect does not depend on the street orientation alone, but is largely determined by the wind speed. An explanation of the phenomenon is given. *Subject Headings:* **1. Tree inclination 2. Wind effects on trees.**—*A.M.P.*

12.5–310 551.556.2:551.312.2(43)

Uhlig, S. (*Bremen*), **Windschutzversuche in der Marsch.** [Wind protection experiments in marshlands.] *Meteorologische Rundschau*, Berlin, 12(3):87–89, May/June **1959.** 2 figs., table. **DWB, DLC**—The author describes the wind protection experiments carried out in the marshlands near Infeld (Nordenham) where drought damage occurs owing to the high wind velocities in spite of the high atmospheric humidity and frequent precipitation. The structure of the wind protection fence, its height, orientation, etc., is described with the aid of a photograph and a graph showing a wind measurement on an undrained meadow and table giving the range of effectiveness of a wind break fence for different wind directions and wind intensities (average of several hourly measurements) as multiple of height of wind break fence. At a slight distance behind the fence the wind is reduced by 50% of its open field value. Also at the point of greatest wind abatement (is $4\text{–}6H$, H = height of fence) 50–60% of the open field value prevails. At a distance corresponding to 12 times the height of the fence 70% of the open field value is attained and at one corresponding to 26 times the height of the fence 90% of the open field value is obtained. On the average the protective effect of the fence in case of SW to NNW winds extends to a distance which corresponds to 21 times the height of the barrier. *Subject Headings:* **1. Wind protection 2. Windbreak effectiveness 3. Infeld, Nordenham, Germany.**—*I.L.D.*

12.5–311 551.556.3:621.311.24

Akaev, A. I., **Metodika opredeleniia moshchnosti vetroelektrostantsii v nevetrovoĭ energosisteme.** [A method of determining the capacity of the wind power electric station in the non-wind power system.] (In: Akademiia Nauk SSSR.. Energeticheskiĭ Institut, **Voprosy vestroenergetiki.** Moscow, **1959.** p. 106–117. 5 figs., table, 5 eqs.) **DWB** (M56.3 A313vo) —Operational advantages of the parallel work of the electric power stations of different types (water, wind, oil, coal, etc.) are discussed in view of specific characteristics of the wind power, changeable in time, space and in intensity. Preservation and accumulation of excess of wind power requires additional costly installations. Therefore, the author discusses set of specific conditions for combined work of the wind and non-wind electric power installations. Under these conditions the capacity of the non-wind power station is required to be equivalent to the wind power station, operation of which is much cheaper than the non-wind power stations. In consideration of maximum economical effect of the parallel operation, the first problem concerns determination of the optimum relation of outputs of the wind and non-wind power electric stations united into such a power system, which is more economical. The second problem concerns the selection of such a method, which permits the use of wind power installation during the whole year round. Solution of these problems are described in detail, with

tabulated data and set of curves. *Subject Headings:* **1. Wind power utilization 2. Electric power systems.**—*N.P.S*

12.5–312 551.556.3:621.311.24

Petry, P., **A characteristic of the wind: its irregularity.** (In: National Research Council of Canada (*comp.*), **Technical papers presented to the Wind Power Working Party (of the O.E.E.C.).** London, H. M. Stationery Office, [1954?]. p. 121–128. fig., eq.) **DWB**—The irregularity of the wind makes it of questionable value for the generation of electricity but the irregularity is less inconvenient in considering its use for pumping water for irrigation. *Subject Heading:* **1. Wind power utilization.**—*E.Z.S.*

12.5–313 551.556.8:551.461.2(210)

Miller, Arthur R., **Report on the effect of winds on coastal water levels of New England.** Woods Hole Oceanographic Institution, Massachusetts, Contract Cwb 8630, Final Report and Contract Nonr 2196(00), Technical Report, March **1957.** 23 p. 8 figs., 7 refs., eqs. **DWB** (551.46 W894rep). —Tidal records from Nantucket Sound, Cape Cod; Montauk, Long Island; and Portland, Maine have been studied along with wind and barometric observations from each location. Results of this study show that departures from mean sea level due to wind are made manifest by dual combinations of symmetrical and asymmetrical responses to wind which are characteristic of the individual localities. The symmetrical term refers to sinusoidal variation of sea level departure as a function of wind direction and applies to the outer coast and general level. Asymmetry of sea level responses to wind depends on the very local topography and fetch lengths about the observing station. The interplay of these two features allows for a scalar variety of sea level and departures subject to wind direction, duration and field size, as well as barometric adjustment. Time-lag between peak winds and maximum sea level departures is probably dependent on the dominance of either the symmetrical or asymmetrical characteristics as well as the size of the effective wind field. *Subject Headings:* **1. Wind effects on water level 2. Coastal waters 3. Nantucket Sound, Cape Cod.** —*Author's abstract.*

12.5–314 551.556.8:551.465

Saint-Guily, B. (*Lab. of Physical Oceanog. of Museum of Paris*), **Essai en vue d'une théorie d'Ekman généralisée.** [Study in relation with Ekman's generalized theory]. *France. Comité Central d'Océanographie et d'Etude des Côtes, Cahiers Océanographiques,* 11(2):101–129, Feb. **1959.** 20 figs., table, 12 refs., 70 eqs. **DLC, DWB**—Theories and fundamentals on oceanographic currents and the quantitative movement of wind mass over the Atlantic, the Antarctic and other water areas are mathematically derived. The existing relation between the current density and the wind directions over such surfaces are illustrated with parametric curves. Equations derived are limited to specific areas but the general application of the principles, with the necessary safety factor, give good results comparable to other treatises cited. *Subject Headings:* **1. Wind effects on water surfaces 2. Wind driven currents.**—*N.N.*

UPPER AIR WIND (551.557)

See also: **Vertical motion and transversal circulation . . . in the summer subtropical jet stream** (Defant), 12.5–14; **N. Hemisphere winds aloft and their variations** (Williams), 12.5–96; **Airborne measurements of wind variations** (Helliwell), 12.5–191; **Data on atmos. circulation to 30 km and above, Chambéry** (Barbé, Ervet), 12.5–196; **Estimating frictional force at 300 mb** (Angell), 12.5–203; **Planetary frontal zones, N. and S. Hemispheres** (Pogosian), 12.5 218; **Cirrus clouds associated with jet stream** (Pellegrini), 12.5–346.

12.5–315 551.557.2:551.524.72

*Berlin. Universität. Institut für Meteorologie und Geophysik, **Frequency distribution of wind vectors and air density over different areas in the Northern Hemisphere, Pt. 1.** Contract DA-91-508-EUC-269. 8 p. of text. 182 tables. **DWB** (M(051) B515fr)—This report contains the statistical distribution in different levels of winds and temperature from 10 stations in Europe as well as in the Far East. The winds have been converted into meridional and zonal components. By means of an arithmetic probability graph paper and cumulative fre-

quency the values of specifical levels have been calculated. All monthly and seasonal values have been listed, and the seasonal tables are plotted, except temperature distribution. The seasonal distribution of temperature has been transferred into deviation from air density in a normal atmosphere (ARDC Model Atmosphere 1956), given in 1%. *Subject Headings:* **1. Horizontal wind components 2. Upper air temperature distribution 3. Northern Hemisphere.** —*Author's abstract.*

12.5–316 551.557.3(265)

U. S. Joint Task Force 7, **A study of the 30,000 foot wind field over the west central Pacific.** Its *JTFMC* TP-5, **1957.** 19 p. 6 figs. (3 fold.) Reproduced from typescript.—Purpose of this study is to indicate that the greater variance of the upper westerlies over the Eniwetok Proving Ground, rather than the underlying trades or the Krakatoa easterlies are more challenging to the forecasters in the Eniwetok Bakini area. Some tentative results as deduced from daily 30,000 ft analyses, mean 30,000 ft analyses May 1955, 1956 and 1957, as well as from comparison between mean charts, are presented graphically and discussed. The "seasonal phase" shifts, and the yet inexplainable changes of hemispheric (or planetary) interaction affecting the observed flow patterns are factors whose values to the forecasting personnel are demonstrated. *Subject Headings:* **1. Upper air wind variations 2. Wind field analysis 3. Pacific Ocean.**—*W.N.*

12.5–317 551.557.5:551.513.2

Avvakumov, V. A., **Polozhenie urovnia maksimal'nykh skorostei vetra v razlichnykh chastiakh struinykh techenii.** [Position of the level of maximum wind speeds in various parts of jet streams.] *Meteorologiia i Gidrologiia*, Leningrad, 3:27–29, March **1959.** 2 tables. **DWB, DLC**—On the basis of aerological observations carried out in Moscow and Minsk in 1952–1953 and on that of AT_{300} and AT_{500} charts the positions of the jet streams over European U.S.S.R. were determined and the maximum wind velocities for 340 cases over Moscow and 342 over Minsk were examined. These were divided into three groups in relation to the point of observations to the axis of the jet, viz.: cyclonic periphery, the axis or near the axis and anticyclonic periphery. On the cyclonic periphery the level of maximum velocity of the wind is, on the average, above the troposphere in all seasons, this is particularly true in winter when the excess amounted to 400 m. Near the axis and on its anticyclonic periphery the level of maximum wind speeds is on the average, 1000–1500 m below the troposphere. Characteristically the mean relative height of the maximum velocities as well as the height of the tropopause, increased from the cyclonic periphery of the jet streams to the anticyclonic periphery. Data showing the frequency of the position of the level of maximum wind velocities relative to the tropopause in different parts of the tropopause (in percent) and mean position of the level of maximum wind velocities relative to the tropopause in different parts of the jet stream (in meters) are presented in tables. *Subject Headings:* **1. Maximum wind velocity levels 2. Jet stream winds 3. Tropopause wind maximum 4. Moscow, U.S.S.R. 5. Minsk, U.S.S.R.**—*I.L.D.*

VERTICAL MOTION (551.558)

See: **Vertical motions and transversal circulations** (Defant), 12.5–14; **Control of inversion height by surface heating** (Ball), 12.5–263; **Microturbulent vertical exchange of mass and heat** (Hollmann), 12.5–268; **Heavy rainfall associated with vertical currents, Delhi** (Kundu), 12.5–356.

HUMIDITY (551.571)

See also: **Atmos. phenomenon** (Zamorskiĭ), 12.5–9; **Air temp. and humidity of cultivated fields** (Muminov), 12.5–77; **Heat balance of forest** (Rauner), 12.5–80; **Airborne measurements of frost-point variation** (Helliwell), 12.5–191; **Comparison of radiosonde and MRF humidity measurement** (Hinkel, Tucker), 12.5–216; **Spectroscopic obs. of water vapor content of stratosphere** (Houghton, Seeley), 12.5–252; **Application of new theory of indifferent equilibrium** (Ackermann), 12.5–260.

12.5–318 551.57:551.491.5

Derpgol'ts, V. F., **Znachenie osadkov meteornogo stoka kak prikhodnoĭ stat'i v balanse prirodnykh vod.** [Importance of hydrometeors as a contribution to the natural water balance.]

Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy, [3rd Conference, Oct. 1957], Vol. 9:93–98, pub. 1959. **DWB** (M79 V985tr), **DLC** (GB651.V83) –In this comprehensive paper, the author gives a large number of examples to show that the importance of hydrometeors as a contributing factor in the natural water balance is greatly underrated in the official data presented by the Soviet Hydrometeorological Service. This is because the following factors are not taken into consideration: 1) liquid and solid horizontal precipitation, clouds and fogs drifting through the dense under brush of forests, especially in mountain-forest, coastal and forest tundra regions; 2) dew, hoar frost, glaze frost and sleet; 3) underground dew and 4) sorption processes, etc. *Subject Headings:* **1. Hydrometeors 2. Hydrologic cycle.**—*A.M.P.*

12.5–319 551.571.3:551.510.41:546.15

Balogh, L. (*Klimatisches Sanatorium, Kekesteto, Ungarn*), **Die Wirkung der Zunahme des Luftfeuchtigkeitsgehaltes auf die in der Luft nachweisbare Jodmenge.** [The effect of increased atmospheric humidity on the amount of iodine detectable in the air.] *Meteorologische Rundschau*, Berlin, 12(6):180–182, Nov./Dec. **1959.** 3 figs., 3 tables, 4 refs. German summary p. 180. **DWB, DLC**—With the aid of a diagram the author describes a device for studying experimentally the behavior of the atmospheric iodine content when the moisture content of the atmosphere is increased artificially. The results of the study show that of iodine present in air at a temperature of 20°C and 35–70% relative humidity only 63% could be shown to be present in the same air after artificial saturation to 99% relative humidity; in the case of 37°C and water vapor saturation 43% of the iodine could be shown to be present in the air. Apparently reactions occurring during evaporation cause iodine to enter into a complex combustion which is not demonstrable by ordinary methods. *Subject Headings:* **1. Humidity effects on atmospheric composition 2. Iodine content of air.**—*Author's abstract and I.L.D.*

12.5–320 551.571.7

†Murcray, David G.; Murcray, Frank H.; Williams, Walter J. et al., **Water vapor distribution above 90,000 feet.** *Journal of Geophysical Research*, Wash., D. C. 65(11):3641–3649, Nov. **1960.** 2 figs., table, 30 refs., eqs. **DWB, DLC.** Also issued as Denver. Univ. Dept. of Physics, Contract Af 19(604)-2069, Scientific Resport No. 5, May 24, **1960.** 15 p. 2 figs., table, 31 refs., eqs. **DWB** (M21.13 D416sc) –The absorptions due to the 6.3μ band of water vapor have been measured for altitudes up to 92,000 ft. On the basis of these absorptions the humidity mixing ratio for the region above 92,000 ft has been calculated. The calculated values range from 1.5×10^{-4} gm/gm to 3.4×10^{-4} gm/gm. The mixing ratio from 40,000 to 92,000 ft has also been calculated and yields values at least on order of magnitude lower than the values obtained above 92,000 ft. It is concluded that there was at least 20 microns of precipitable water above 92,000 ft over Alamogordo, N. M. on June 19, 1959. *Subject Headings:* **1. Water vapor absorption bands 2. Vertical water vapor distribution 3. Water vapor in stratosphere.**—*Authors' abstract.*

EVAPORATION-EVAPOTRANSPIRATION (551.573)

See also: **Relationships between harvests and evap. deficit** (Savina), 12.5–71; **Irrigation of sugar beets and potatoes** (Cavanillas Rodríguez), 12.5–72; **Occurrence of stratus and drizzle, Winnipeg** (Reimer), 12.5–347; **Moisture exchange between atmos. and Alpine snow surfaces** (Martinelli), 12.5–366.

12.5–321 551.573:551.579.5

†Covey, Winton G., **Testing a hypothesis concerning the quantitative dependence of evapotranspiration on availability of moisture.** Texas. A. and M. College. Dept. of Oceanography and Meteorology, Contract DA-36-038 Sc-74975, Research Report, No. 1, Dec. **1958.** 58 p. 7 figs., 7 tables, 29 refs., 86 eqs. **DWB** (M(051) T355res) (Run as Thesis in 10C, March 1959, *Met. Abs.*)—The necessity of a surface-moistness parameter and relationship to complete the mathematical model of evapotranspiration based on the energy balance and energy transfers is discussed. Elaboration is made on an hypothesis previously presented by HALSTEAD and coworkers—namely, that evaporative heat flux is proportional to "surface" vapor-pressure deficit, the constant of proportionality serving as a measure of surface

moistness. The necessary assumptions are made on other unresolved questions so that th surface-moistness hypothesis may be tested against the data of Project Great Plains (a O'Neill, Nebraska, in Aug. and Sept. 1953). Values of the surface-moistness paramete derived for the seven general observation periods show a reasonable relationship to soil-moistur content. Values of surface moistness in the range 0.31×10^{-4} to 8.45×10^{-4} (cal/cm² sec mb are reported. *Subject Headings:* **1. Evapotranspiration studies 2. Evaporation-soil moistur relationships.**—*Author's abstract.*

12.5–322 551.573:551.577.3:551.579.4(42C

Edwards, Pamela (*Natl. Inst. of Oceanog.*), **Differing water budgets in two adjacent reser voirs.** *Royal Meteorological Society, Quarterly Journal*, 86(369):412–414, July **1960.** 2 figs **DWB, DLC**—Before making experiments at Kempton Park East and Kempton Park Wes Reservoirs, Hanworth, London, Eng., with surface films intended to reduce evaporation, i was necessary to compare the variations of water level in the two similar adjacent reservoirs Although they were in relatively flat country, significant differences in their water budget appeared which are described in this note. *Subject Headings:* **1. Reservoir effects on wate balance 2. Water level variations 3. Evaporation from reservoirs 4. Hanworth, England** —*Author's abstract.*

12.5–323 551.509.6:551.573:551.4

†Hellström, B. and Janson, L.-E., **Evaporation from water surfaces coated with a film o stearyl alcohol.** *Stockholm. Tekniska Högskolan, Handlingar*, No. 146, **1959.** 18 p. 2 figs (incl. photo), 4 tables, 17 refs. **DLC**—To investigate the problem as to how evaporation dependent on different coatings of stearyl alcohol, laboratory studies were made in 1958 at th Division of Hydraulics of the Royal Institute of Technology, Stockholm. The equipmen procedures and various surface coatings are described. Test results are tabulated and dis cussed. Evaporation from a water surface covered with a film of stearyl alcohol can be reduce to 50 to 55% of the evaporation from a free water surface. The results refer to condition when no wind occurred. A photograph of laboratory equipment and an annotated bibliograph of 17 references are included. *Subject Headings:* **1. Evaporation control 2. Evaporation fro water surfaces 3. Stockholm, Sweden.**—*E.Z.S.*

12.5–324 551.573:631.6:581.11

Hudson, J. P. (*Dept. of Horticulture, Univ. of Nottingham, School of Agric.*), **Plants an their water supply.** *New Scientist*, London, 8(209):1328–1330, Nov. **1960.** 3 figs. **DWB** The importance of irrigation and the process of transpiration are described briefly. On problem still to be answered is when to apply water to prevent yield from being depressed b lack of water. To answer this query the main need is for experiments to measure the transpira tion rate of plants. This requires machines capable of weighing large quantities of soil to high degree of accuracy. Such an instrument has been developed by the National Institute o Agricultural Engineering. Having measured evapotranspiration rates an attempt must h made to correlate them with meteorological factors. If this can be done then the meteorologica readings can subsequently be used to estimate irrigation needs. The main difficulties lie in th complexity of the soil and plant variations. *Subject Headings:* **1. Plant transpiration measure ment techniques 2. Irrigation 3. Evapotranspiration from crops 4. Transpiration-meteoro logical elements relationships.**—*R.B.*

12.5–325 551.573:551.578.462:551.585.55(571

Mosienko, N. A.; Pavlenko, G. V. and Khudomiasova, Iu. V., **Isparenie s poverkhnos snezhnogo pokrova v usloviiakh stepnykh raĭonov Zapadnoĭ Sibiri.** [Snow surface evaporatio in the steppe regions of western Siberia.] *Meteorologiia i Gidrologiia*, Leningrad, No. 8:24–2 Aug. **1959.** 2 figs., 1 table, 12 refs. **DWB, DLC**—Measurements of evaporation from th surface of a snow cover during the snow melt period were carried out in Novosibirsk in 195 1956 and 1957. Evaporation was determined by exposing in snow cylindrical vessels an weighing them with an accuracy of 0.01 g. Weighing was carried out twice a day at 7–8 hour and 19–20 hours in order to separate diurnal and nocturnal evaporation. The results of th

investigation indicate the following, viz: (1) evaporation from a snow surface in the steppe regions of western Siberia is slight and amounts to only 3–5 mm during the entire snow melt period; (2) in spite of the small absolute values of evaporation of snow there exists a marked difference in diurnal and nocturnal evaporation and these fluctuations depend upon atmospheric temperature and humidity; (3) during spring, evaporation of snow ceases almost entirely when the sky is cloudy since condensation predominates over evaporation; and (4) when clear weather prevails evaporation predominates at the beginning of snow melt but condensation at the end. *Subject Headings:* **1. Evaporation from snow cover 2. Steppe climates 3. Western Siberia.**—*I.L.D.*

12.5–326 551.573:581.11

Senshū, T., **On the estimation of evapotranspiration from land.** *Journal of Meteorological Research*, Tokyo, 11(9):762–771, **1959.** 22 figs., table, 2 refs., 12 eqs. In Japanese; English summary p. 762. **DWB, DLC**—To forecast the total discharge from a catchment area, we cannot neglect the effect of evapotranspiration from land. A method is given for estimating evapotranspiration (E_v) by means of energy budget on the earth's surface.

$$E_v = \frac{1}{L(1+R)}\{(1-\gamma)I-B\},$$

where I is the solar incidence, γ the albedo of land, B the nocturnal radiation and R the Bowen ratio. The author has obtained the value 1 to 2 as the Bowen ratio by means of the method of energy budget and water budget on each catchment area in Japan. The author has calculated the daily evaporation from land (E_r) by the above method, and also the water storage under catchment area (Z) by means of the following formula $\frac{dZ}{dt} = P-Q-E_r$, where P is the daily precipitation and Q the discharge from the catchment area. The author has also shown an application for forecasting the discharge by means of the unit-graph method with parameter Z. *Subject Heading:* **1. Evapotranspiration formulas.** —*Author's abstract.*

12.5–327 551.573:551.579.5

Wooding, R. A. (*Emmanual College, Cambridge*), **Rayleigh instability of a thermal boundary layer in flow through a porous medium.** *Journal of Fluid Mechanics*, London, 9(2):183–192, Oct. **1960.** 2 figs., 7 refs., 25 eqs. **DWB, DLC** —It is supposed that a heated liquid is rising very slowly through a semiinfinite porous medium towards the permeable horizontal surface, where it mixes with a layer of cool overlying fluid. In the steady state a thermal boundary layer of exponential form exists in the medium. It is shown that the layer is stable provided that the Rayleigh number for the system does not exceed a critical positive value, and that the wave number of the critical neutral disturbance is finite. The stability properties of the layer are explained qualitatively from physical considerations. *Subject Headings:* **1. Soil moisture 2. Evaporation.**—*Author's abstract.*

CONDENSATION (551.574)

See also: **Discovery of condensation nuclei** (Verzár), 12.5 46; **Melioration effect as shown by relationships between harvest and evaporation deficit** (Savina), 12.5-71; **Measurement of condensation nuclei during flight** (Podzimek), 12.5–205; **Freezing nuclei above the tropopause** (Telford), 12.5 253; **Size distribution of falling snow** (Itoo), 12.5–361; **Snow and ice storm, U. S., Dec. 1959,** 12.5 363; **Electrification of cloud droplets** (Twomey), 12.5–411.

12.5–328 551.574

Dodd, K. N. (*Royal Aircraft Establishment, Farnborough*), **On the disintegration of water drops in an air stream.** *Journal of Fluid Mechanics*, London, 9(2):175–182, Oct. **1960.** 2 figs., refs., eqs. **DWB, DLC**—A theory is developed, based on the very limited available experimental evidence, to predict the distortion and disintegration of a water drop when it is exposed to a stream of air with continuously increasing relative velocity. The theory is applied to

water drops situated in the path of a solid sphere moving through the air. *Subject Headings* **1. Drop shattering by air streams 2. Drop impingement.**—*Author's abstract.*

12.5–329 551.574.1:016(47) 551.509.6(47)

†Battan, Louis J. (*Inst. Atmospheric Physics, Univ. Ariz.*), **Cloud-physics research in th Soviet Union.** *American Meteorological Society, Bulletin*, 40(9):444–464, Sept. **1959.** Bibliog p. 455–464. **DWB, DLC**—A thorough review of recent (1948–58) Soviet research in clou physics and cloud seeding as evidenced by the published literature available in the U. S Citations are unusually complete although the author has not given the titles of the articles i the original language. The 400-odd articles are discussed under 10 main headings: 1) atmos pheric nuclei and precipitation chemistry; 2) cloud formation and structure; 3) cloud drople spectra and liquid-water content in clouds; 4) raindrop spectra; 5) ice crystal and snowflak spectra; 6) precipitation processes; 7) atmospheric electricity; 8) instruments; 9) rada 10) cloud seeding and weather modification. The conclusion reached is that research in clou physics is advanced about as far as in the U. S. although in radar cloud physics studies and i silver iodide and warm cloud seeding techniques, there is a considerable lag in the U.S.S.R Many suggestions have been made and some experiments conducted for suppressing hail, fog stratus and cumulus clouds, for warming the polar regions with an artificial sun (thermonuclea reactor in a satellite), or nuclear explosions and for damming the Bering Strait, etc. Th extensive list of references is divided into two parts: one with actual translations available a the designated source, and the other with no translation yet discovered by the author. *Subjec Headings:* **1. Soviet cloud physics research 2. Cloud physics bibliographies 3. Weathe modification research 4. U.S.S.R.**—*M.R.*

12.5–330 551.574.1:551.578.4

Bigg, E. K. (*Radiophysics Lab., Sydney, Australia*), **A long period fluctuation in freezin nucleus concentrations.** *Journal of Meteorology*, Boston, 15(6):561–562, Dec. **1958.** fig 3 refs. **DWB, DLC**—The author attempts to show that there exist long period fluctuations i concentrations of freezing nuclei and that during these fluctuations the ice-crystal concentratio at a given temperature remains abnormally high or abnormally low for several weeks at a time Measurements were made on the eastern coast of Australia from Nov. 1956 to the beginning Feb. 1957 at 26½°S lat. and 153°E long. A graph of ice crystals counted at −20°C show a lon continuous series of low readings from early Nov. until mid-Dec. followed by a period wit comparatively high readings until mid-Jan. The period of low crystal counts was one unusually dry weather in Queensland and delayed commencement of summer rainfall in Dec coincided with greatly increased counts. Various possible reasons for the crystal coun increase are suggested. *Subject Headings:* **1. Freezing nuclei 2. Ice crystal growth rate** —*I.L.D.*

12.5–331 551.574.1:541.82:546.5

Godard, Serge, **Mesure des gouttelettes de nuage avec un film de collargol.** [Clou droplets measurement with a collargol film.] *Puy de Dome. Observatoire, Bulletin*, No. 2 41–46, April/June **1960.** 6 figs., 4 refs. **DWB**—The use of a solution of collargol in wate applied on a slide or on a celluloseacetate film, permits to size droplets of fogs or clouds. Ther exists indeed a simple relationship between the diameter of a droplet and the exterior diamet of the dark ring belonging to the trace left by the droplet on the collargol slide. This relation as follows: $d = k \cdot D$ with $k = 0.34 \pm 0.03$, d being the diameter of the droplet and D the exteric diameter of the dark ring left by this droplet. This method permits to accomplish in a ver simple manner the granulometry of a fog or a cloud. No particular precaution is required fc the preparation of collargol slides or collargol films and the slides can be used 5 to 10 minute after they have been prepared. On the other hand, the droplet's impact remains indefinitel on the slides and these may be processed and analyzed several weeks after their ultilizatior Glass slides can be kept when wrapped in a sheet of paper and the films wound on a spool. Th examination of either collargol glass plates or collargol films under the microscope does not nee any special optical device. *Subject Headings:* **1. Drop size measurement techniques 2. Co largol film.**—*A.V.*

12.5–332 551.574.1:551.578.41

Higuchi, Keiji (*Hokkaido Univ., Japan*), **On the coalescence between plane snow crystals.** *Journal of Meteorology*, Boston, 17(3):239–243, June **1960.** 7 figs., 3 tables, 9 refs., 3 eqs. **DWB, DLC** —The calculation of the probability of coalescence between two plane snow crystals is described in detail. As the result of calculation, it was concluded that this probability is minimum when two crystals are of the same size, the probability increasing with the difference in size. Being concerned with the distance between the centers of two combined plane crystals the author found that the most probable value was about a quarter of the sum of the diameters of two crystals. *Subject Headings:* **1. Coalescence theories 2. Snow crystals.**—*Author's abstract.*

12.5–333 551.574.1:551.594.21

Hutchinson, W. C. A. (*Univ. Durham*), **Ice-crystal contact electrification.** *Royal Meteorological Society, Quarterly Journal*, 86(369):406–407, July **1960.** fig., 3 refs. **DWB, DLC**—An experimental investigation of electrification accompanying the momentary single contact of vapor-grown ice crystals at the same or at different temperatures suggests that any such effect is much smaller than might be expected from Reynolds's report on charging observed with riming spheres and vapor-grown ice crystals. *Subject Heading:* **1. Electrification of ice crystals.** —*Author's abstract.*

12.5–334 551.574.1:551.515.4:551.21

Komabayasi, M. (*Tokyo Univ.*), **The suppression of thundercloud occurrence by frequent volcanic eruptions, Pt. 2.** *Meteorological Society of Japan, Journal, Ser.* **2**, 37(3):79–82, June **1959.** fig., 2 tables, 4 refs. Japanese summary p. 82. (For Pt. 1, *see* 10.4–260, April 1959, *Met. Abs.*) **DWB, DLC**—Statistical investigations have shown that the number of thundercloud occurrences in the district surrounding the Asama Volcano has a remarkable inverse relation to the eruptive activity of the volcano during the summer season, especially in Aug. The inverse relation between them has been analyzed under the time scale of a month in the previous report. Here, the relation is analyzed in the time scale of day. It is found that the thundercloud occurrences are remarkably decreased for a day following the eruption of Asama. *Subject Headings:* **1. Thunderclouds 2. Volcanic eruption effects on thunderstorm activity 3. Japan.**—*Author's abstract.*

12.5–335 551.574.1:778.3

Magono, C. and Nakamura, T. (*both, Hokkaido Univ.*), **On the behavior of water droplets during collision with a large water drop.** *Meteorological Society of Japan, Journal, Ser.* **2**, 37(4):124–127, Aug. **1959.** 5 figs., 2 refs. Japanese summary p. 127. **DWB, DLC**—Results obtained during observation of the behavior of water droplets by slow shutter speed photographs during their collision with a large stationary water drop. Included are descriptions of laboratory methods, a vertical section of the apparatus and photographs of droplets. The larger the droplets, the more often they tear off a portion of the drop and the smaller the droplet, the more often they are rejected when they collide, but whether a droplet is captured or rejected depends on some delicate condition, perhaps on some slight impurity of water used. *Subject Headings:* **1. Cloud droplet collision efficiency 2. Drop motion photographs.**—*E.Z.S.*

12.5–336 551.574.1:551.578.11

Mason, B. J. and Andrews, J. B. (*both, Imperial College, London*), **Drop-size distributions from various types of rain.** *Royal Meteorological Society, Quarterly Journal* 86(369):346–353, July **1960.** 5 figs., table, 13 refs. **DWB, DLC** —Notable differences are found in the size distribution of raindrops reaching the ground from frontal clouds exhibiting a radar melting-band which is indicative of Bergeron-type rain; from small, warm shower clouds in which the rain is formed by coalescence; and from thunderstorms. These differences are illustrated by typical drop size spectra and by plots of median-volume drop diameter against rainfall intensity for the three classes. *Subject Headings:* **1. Drop size distribution 2. Raindrop sizes.** —*Authors' abstract.*

FOG (551.575)

See also: **Observational instructions on fog** (Baliles), 12.5–45; **Rapid spread of Lincolnshire fog during a Feb. afternoon** (Bradbury), 12.5–220; **Occurrence and forecasting of fog, Oslo airport** (Tandberg), 12.5–229; **Optical method for determining aerosol particle spectra** (Petrov), 12.5–248; **Attenuation of infrared radiation by fogs** (Kurnick et al.), 12.5–290; **Scattering function for fogs** (Spencer), 12.5–402; **Formation and structure of rare fogs, Jodhpur** (Venkateswara Rao, Mukherjee), 12.5–405.

12.5–337 551.575.1(26):551.576.1(716

Day, D. C., **An investigation of sea fog and stratus formation at Yarmouth, N. S.** *Canad Meteorological Branch, CIR*-3062; TEC-273, June 24, **1958.** 7 p. fig., 2 refs., 3 graphs **DWB, DLC**—At a time when the air temperature is higher than the coastal waters, there i maximum occurrence of fog and stratus at airports near the ocean. A large difference betwee surface air temperature and the underlying water surface and high relative humidity are th causes of advection fog. Two sets of graphs were used for Yarmouth. Fog and stratus dat were collected for the years 1950–57. If the visibility was less than ½ mi, the case was con sidered a fog. A graph was employed using the wind speed and the difference between th average temperature over Yarmouth. This method also took into account the average stabilit of the air, the wind velocity and direction, and water temperature. The cooling formula wa tried to see if it was satisfactory for fog forecasting. In some cases the temperature coole below the dew point but no fog was formed. The charts given are a definite aid in forecastin sea fog although the application of the chart is limited to certain wind directions. *Subje Headings:* **1. Sea fog formation 2. Stratus formation 3. Yarmouth, Nova Scotia.**—*A.H.K.*

12.5–338 551.575.1:551.524.31(497.1

*Manohín, V. (*IIydromet. Service, Ljubljana*), **Uticaj magle na temperaturu vazduha** [Influence of fog on the air temperature.] *Yugoslavia. Hidrometeorolška Služba, Vesni* 7(3/4):102–105, July/Dec. **1958.** 2 tables. **DWB**—Daily mean temperatures are listed fo Ljubljana (el. 300 m), Voglje (37 m) and Šmarna Gora (667 m) for selected days with variou fog situations (1948–1949). The temperature values at the three places (situated in the sam climatic area but in different locations from the point of view of fog occurrence) are compare and discussed as to the apparent effect of fog on the daily temperature. Such a temperatur effect of fog is found to be slight in summer, but increasing toward winter, reaching its maximu in December. *Subject Headings:* **1. Fog effects on temperature 2. Annual temperatur variations 3. Yugoslavia.**—*G.T.*

12.5–339 551.575.1:551.510.4

Mayrsohn, H. and Mader, P. P. (*both, Air Poll. Control District, L. A., Calif.*), **Polarc graphic properties of smog aerosols.** *International Journal of Air Pollution,* N. Y., 2(3) 283–290, March **1960.** 5 figs., 2 tables, 6 refs. **DWB, DLC**—Based upon observations tha atmospheric aerosols collected on filter papers exhibited oxidant properties, it seemed reasonabl to expect that these aerosols would be electro-reducible, hence capable of rapid and precis analysis with the polarograph and dropping mercury electrode. Under the described exper mental polarographic conditions atmospheric aerosols yielded a simple, stable and consisten voltage pattern consisting of not more than two half-wave potential values, regardless of th geographical source of the sample. One wave was identified as due to lead ions. The secon wave which was always present in samples taken during smog episodes, was not definitel identified, but is apparently associated with $(NO)_x$ olefin reaction products. It was found tha the aerosols resulting from automobile exhaust yielded polarograms strikingly similar t atmospheric aerosols and that the resultant diffusion current was a function of the olefin conten of the original fuel. *Subject Headings:* **1. Smog 2. Aerosol sampling and analysis.**—*Author abstract.*

12.5–340 551.575.5(524

Amamiya, S., **A local mist in Kushiro City.** *Journal of Meteorological Research,* Tokyo 11(7):639–643, July **1959.** 6 figs., 6 tables, 3 refs. In Japanese. **DWB, DLC**—In winte the mixed combination of a dense fog and a dense smog appeared in Kushiro City and along th

coast of Kushiro River, where N-NE wind and temperature of −15°C below prevails in the early morning. Using the data for Jan., Feb., Mar. and Dec. 1949–1951, the investigation dealt with such factors as cause, disappearance, maximum density, monthly frequency, continuity, relationships between wind speed and direction and development relationships between minimum air temperature and difference of mist, inversion layer and pressure distribution at the time of appearance. The results in tables and figures indicate that the cause was due to an intermixture of smoke produced in the city and condensation of water vapor, but the latter was a conditional factor in mist formation. *Subject Headings:* **1. Mist 2. Fog formation 3. Kushiro, Japan.**—*K.C.*

CLOUDS (551.576)

See also: **Cloud refractive index studies** (Harrington), 12.5 65; **Cloud amount estimation** (Müller), 12.5–195; **Occurrence and forecasting of stratus, Oslo airport** (Tandberg), 12.5–229; **Daytime fog clearance, Exeter airport** (Saunders), 12.5–230; **Pressure difference between cloud and its environment** (Van Thullenar), 12.5–302; **Sea fog and stratus formation, Yarmouth** (Day), 12.5–337.

12.5–341 551.576:797.55

Carroll, B. **Dice with a cumulonimbus.** *Sailplane and Gliding*, London, 11(6):368–369, Dec. **1960.** fig. **DLC**—A description is given of a glider pilot's experiences in flying through turbulent shower cloud. The glider climbed in and out of cloud to a height of 13,000 ft. The turbulence, icing and precipitation was frightening. *Subject Headings:* **1. Cumulonimbus 2. Glider flights.**—*R.B.*

12.5–342 551.576.1:061.3(47)

Aleksandrov, E. L., **VI Vsesoiuznaia oblachnaia konferntsiia.** [Sixth All-Union cloud conference.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 10:1526–1527, Oct. **1959. DLC**—The Conference was held during June 15–20, 1959 in the Institute of Applied Geophysics of the Academy of Sciences, U.S.S.R., on clouds, precipitation and active effects. The conference was arranged in order to coordinate Soviet Studies on the physics of clouds and precipitation at the Division of Physical and Mathematical Sciences of the Academy of Sciences, U.S.S.R. The representatives of 44 scientific-research organizations of the U.S.S.R. and representatives of the Academy of Sciences of the Chinese Peoples Republic participated in the Conference. Sixty-eight papers were read on the results of studies in the sphere of aerology, aerosynoptic physics of clouds and their active influences, electricity of clouds, radiational properties of clouds and construction of special apparatus. The following problems were also considered: microphysical processes of cloud formation, thermodynamic and microphysical studies of clouds and many other macro- and micro-size activities. General conclusions and resolutions are listed in the text. *Subject Headings:* **1. Cloud conferences 2. U.S.S.R.**—*N.P.S.*

12.5–343 551.576.1:778.3

Bilancini, R., **La fotografia delle nubi.** [Cloud photography.] *Rivista di Meteorologia Aeronautica*, Rome, 19(2):49–50, April/June, **1959. DLC**—Cloud photography is used as a scientifically valuable as well as artistically enjoyable activity. The requirements are listed, namely: a camera using 24×36 mm film, with an aperture of 1:3.5 and with good lenses. Medium yellow, orange and red filters are needed. The film should be of relatively low sensitivity with fine grains and high contrast. The use of the filters, time of exposure, etc. are discussed. *Subject Heading:* **1. Cloud photography.**—*I.L.D.*

12.5–344 551.576.1:551.515.3

Hoddinott, M. H. O., **Funnel cloud at Chester, July 28, 1959.** *Meteorological Magazine*, London, 89(1053):124–125, April **1960.** 4 photos. **DWB, DLC**—Describes a funnel cloud photographed on 20 July 1959. It was seen hanging from the edge of a developing cumulus cloud. Plate III shows, it's smooth column threw out fringes of tiny cloudlets every few seconds. After some time it became ragged and shorter. According to a witness its tip did not reach the ground. Since 1955 the area has been a beehive of industrial activity. The

considerable convectional energy may be responsible for the cloud. *Subject Headings:* **1. Funne clouds 2. Chester, Eng.**—*A.H.K.*

12.5–345 551.576.1:629.135.

Lokke, Donald H., **Jet condensation trail shadows.** *Monthly Weather Review*, Wash. D. C., 88(5):181, May **1960.** 2 photos. **DWB, DLC**—Shadows of jet condensation trail were observed and photographed in northeastern Kansas at noon on Nov. 1, 1955 and prio to sunset on June 14, 1956. Two photographs taken Nov. 1, 1955, show the shadows made fou minutes apart, in each case the shadow is on the right side of the jet condensation trail. *Subjec Heading:* **1. Jet aircraft contrails.**—*E.Z.S.*

12.5–346 551.576.1:551.513.2:551.557.

Pellegrini, Francesco, **Alcune considerazioni sui cirri che accompagnano la corrente a getto.** [Cirrus clouds associated with the jet stream.] *Rivista di Meteorologia Aeronautica* Rome, 20(3):35–38, July/Sept. **1960.** 2 figs., 8 refs., Italian, French, English and Germa summaries p. 35. **DLC**—Chiefly for the purposes of air navigation, the author gives here a summary of lately collected data with reference to the distribution of clouds and other charac teristics associated with jet stream. *Subject Headings:* **1. Cirrus clouds 2. Jet stream clouds** —*Author's abstract.*

12.5–347 551.576.1:551.578.1:551.573:551.481.1(285:71

Reimer, A., **A study of the occurrence of stratus and drizzle at Winnipeg on Sept. 6, 1957** *Canada. Meteorological Branch, CIR*-3065; TEC-274, June 30, **1958.** 5 p. 2 figs., ref **DWB, DLC**—Describes a rainy day in Winnipeg. The drizzle was due to the cloud win moving southward. The temperature dropped from 70°F to 51°F and the dew point dropped from 57°F to 49°F. Theoretically the weather developed due to evaporation from and heating by the relatively warm water surface of Lake Winnipeg and cooling of this air mass as it moved over the cold land surface. *Subject Headings:* **1. Drizzle 2. Precipitation formation 3. Winni peg, Manitoba.**—*A.H.K.*

12.5–348 551.576.11:632.18

Johnson, Oliver, **The development of a cumulus cloud over a prairie grass fire.** *Weather* London, 14(6):212–215, June **1959.** 2 figs. **DWB**—Radiosonde ascents indicated that no convective cloud would have formed in the absence of local influence. The water vapor for the cloud over the fire came from evaporation of the moisture from any green grass and from the top layers of the ground, and also from the combustion of the grass. *Subject Headings* **1. Cumulus cloud formation 2. Grass fires.**—*E.Z.S.*

PRECIPITATION (551.577)

See also: **Forest and climate** (Fel'dman), 12.5–82; **Use of radiation balance meters for heat economy investigations** (Frankenberger), 12.5–209; **Methods of precip. measurement** (Hesselberg), 12.5–215; **Energy budget during rainy season, Far East** (Murakami), 12.5–224; **Precip. forecasting, Australia** (Kraus), 12.5–233; **Disturbances in S.W. Indian Ocean, summer 1958/59** (Chaussard, Laplace), 12.5–277; **Water budgets of two adjacent reservoirs, Hanworth, Eng.** (Edwards), 12.5–322.

12.5–349 551.577:551.584.4:634.11

Hoffmann, K., **Niederschlagsmessungen in einer Apfel-Viertelstammanlage.** [Precipita tion measurement in a half-standard apple orchard.] *Angewandte Meteorologie*, Berlin 3(11):345–351, May **1960.** 2 figs., 3 tables, 9 refs. German and English summaries p. 345 **DLC**—In this study, the author reports on precipitation measurements made in a fifteen yea old half standard apple orchard with completely closed spacing. Resulting values are modifie by the pattern of the crown region and its state of foliation, the duration and intensity of precipitation, and the respective wind direction. *Subject Headings:* **1. Precipitation interception by orchards 2. Orchard microclimatology 3. Apple orchards.**—*Author's summary.*

12.5–350 551.577.21(931)

Browne, M. L., **Typical rainfall patterns over central Otago.** *New Zealand Journal of Geology and Geophysics, (Wellington)*, 2(1):88–94, Feb. **1959.** table, 9 figs. —Reprinted as *New Zealand. Meteorological Service, Meteorological Office Note* No. 46, **1959. DLC**—A table has been prepared of synoptic situations associated with rainfalls of 0.25 in. or more at any of seven selected stations throughout central Otago. These situation types are discussed with the aid of rainfall charts prepared from observations at approximately 170 rainfall stations in Otago and Southland. *Subject Headings:* **1. Rainfall amounts 2. Rainfall charts 3. Otago, New Zealand.**—*Authors' abstract.*

12.5–351 551.577.21:551.579(282.243.7)

†Újvári, József, **A Duna vízgyűjto területének több évi közepes csapadék és fajlagos lefolyási térképei.** [Map of the mean precipitation and specific drainage values for the catchment area of the Danube over many years.] *Hidrológiai Közlöny*, Budapest, 38(3): 188–194, June **1958.** 3 figs., 3 tables, 44 refs., eq. Russian and German summaries p. 194. **DWB** –The amounts of precipitation and the runoff modules influencing the hydrological regime of the Danube basin are presented on maps. Runoff modules for 1954 were used since the most recent data on the catchment basin of the Danube in Germany and Austria were unavailable. While the map constructed is not homogeneous, it has considerable value especially for the southeastern part of the Danube basin. The data presented are a considerable advance over the first precipitation map constructed by W. LÁSZLÓFFY. *Subject Headings:* **1. Precipitation data 2. Hydrologic regime 3. Danube River Basin.**—*Based on German summary (I.L.D.).*

12.5–352 551.577.32:551.579.5(477)

*Astakhova, N. I., **Defisit osadkov v kholodnyĭ period goda na Ukraine.** [Precipitation deficit during the cold period in the Ukraine.] *Kiev, Ukraine. Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, No. 17:50–57, **1959.** 8 tables, 2 refs. **DWB** –The replenishment of soil moisture reserves during the winter in the Ukraine is accomplished by liquid precipitation and melt water. Hence insufficient winter precipitation is reflected in the distribution of soil moisture in spring. The author investigated the frequency of precipitation deficit in the winter in the Ukraine and its effect upon the accumulation of soil moisture. Precipitation deficit is defined as that amount of precipitation at a particular station during the winter period (Nov.–March) which does not exceed 80% of the normal, and surplus precipitation as that amount which exceeded the normal by more than 120%. Data from 187 Ukraine stations for the period 1890–1941 and 1944–1955 were used. Data are presented on the frequency of precipitation deficit and surplus during the winter for varying proportions of the Ukraine territory, frequency (in per cent) of productive moisture in the meter layer of the soil during the fall before the winter period with precipitation deficit, frequency of productive soil moisture in the meter layer of the soil during the spring after cold periods with precipitation deficit, etc. Precipitation deficit during the winter occurred in the Ukraine on the average of once in 3–4 years. Precipitation deficit in the winter occurring simultaneously over the entire Ukraine is a very rare phenomenon –once in 62 years. Following cold winters with precipitation deficits and inadequate soil moisture saturation in the fall it is 100% probable that the soil will not be well saturated in the spring. Following cold periods with surplus precipitation, even in the case of inadequate soil moisture saturation in the fall, the probability is more than 89% that the amount of soil moisture will be close to complete saturation. With increase of fall soil moisture reserves the influence of the amount of precipitation during winter on the spring soil moisture reserves will diminish. *Subject Headings:* **1. Precipitation deficit data 2. Soil moisture 3. Ukrainian S.S.R.**—*I.L.D.*

12.5–353 551.577.33/4(45)

†Depietri, Carlo, **Periodicita delle precipitazioni in Italia.** [Rainfall periodicity in Italy.] *Modena. Università. Osservatorio Geofisico, Pubblicazioni*, No. 69, **1958.** 19 p. fig., 38 refs. **DWB** (D/dh235 Ao-3) Periods of 48, 24, 16, 11.2, 8.6, 5.3, 4, 2.7 and 2 years are taken from a mean precipitation record for 1831–1951 (120 years) for 13 Italian stations.

Records are shown graphically and different periods discussed at length. *Subject Headings:* **1. Precipitation cycles in Italy 2. Rainfall periodicities 3. Italy.** —*M.R.*

12.5–354 551.**577.36/7**:519.24

*Hershfield, D. M. and Kohler, M. A. (*both, U. S. W. B., Wash., D. C.*), **An empirical appraisal of the Gumbel extreme-value procedure.** *Journal of Geophysical Research*, Wash., D. C., 65(6):1737–1746, June **1960.** 6 figs., 8 tables, 9 refs., 3 eqs. Also **Discussions** by D. L. Brakensiek, M. A. Benson and Irving I. Gringorten, *Ibid.*, 65(12):4217–4220, Dec. **1960. DLC** —In this study the predictive value of the widely used Fisher-Tippett type I distribution, when fitted to rainfall data by the Gumbel method, is appraised. Thousands of station years of rainfall data have been analyzed in several ways in evaluating the Gumbel procedure. The results provide evidence of the acceptability of the Gumbel procedure for predicting the probability of occurrence of the extreme values of rainfall. *Subject Headings:* **1. Rainfall intensity —frequency regime 2. Rainfall probability 3. Gumbel's method.**—*Authors' abstract.*

12.5–355 551.**577.37**(47)

Beliaev, A. F., **Sil'nyĭ liven' v Rostove-na-Donu.** [Heavy downpour at Rostov-on-Don.] *Meteorologiia i Gidrologiia*, Leningrad, No. 2:45, Feb. **1959. DWB, DLC** —On June 16, 1958 flocculent altocumulus clouds were observed from 0050 o'clock. Air temperature was 19°C, with light wind. Toward evening the temperature dropped from 25° to 15°C, the northwest sky became covered with dense cumulonimbus clouds and the wind intensified. After a brief shower of large sparse rain drops an intense downpour began. Visibility was reduced to less than 100 met., thunder and lightning continued. The downpour lasted 30–40 minutes. At night the downpour resumed. Between 0200 o'clock June 16 and 1700 o'clock June 17, 1958, there fell 71 mm of rain in the center of the city, 87 mm in the northern part and 61 mm on the outskirts. *Subject Headings:* **1. Excessive rainfall 2. Rostov-on-Don, Rostov Region, U.S.S.R.** —*I.L.D.*

12.5–356 551.**577.37**:551.**558.2**(547)

Kundu, T. K. (*Met. Office, New Delhi*), **Heavy rainfall over Delhi during July 20–21, 1958 and the associated vertical currents.** *Indian Journal of Meteorology and Geophysics*, New Delhi, 10(4):454–456, Oct. **1959.** 2 figs., table, 2 refs., eqs. **DWB, DLC**—The note examines the meteorological situation under which this heavy downpour occurred over Delhi and estimates the vertical currents associated with the heavy rainfall on July 21, 1958. The rainfall during 24 hours at 4 neighboring stations and mean and maximum vertical currents are tabulated. The S.R. rain gage record for July 21 and the intensity of the rainfall per hour are graphically represented. It is concluded that the rainfall was mainly convective from clouds with large moisture content and vertical currents. *Subject Headings:* **1. Rainfall-intensity-duration charts 2. Vertical currents 3. Delhi, India.**—*I.S.*

12.5–357 551.**577.37**:551.**579.4**

Kuznetsov, N. T., **Katastroficheskiĭ pavodok.** [Catastrophic flood.] *Priroda*, Moscow, No. 9:127–128, Sept. **1959. DLC**—The author describes the flood that occurred in the city of Kucha in Sinkiang during the summer of 1958. This city is situated on the Kucha River just below its exit from the gorge of a tertiary ridge parallel to the Tien Shan range. The river is fed primarily by the melt waters of seasonal snow. On issuing from the mountains the river cuts through the ridge with a well-developed network of temporary streams through which rain water flows. From one of these streams the Janshigow and from the right branch of the Kucha the first flood wave developed. It arrived in the early morning when the inhabitants were asleep. The water rise was so rapid that a bridge was carried away in an hour and the water rose 2.5–3.00 m above flood level and 1.0–1.02 m above the places adjacent to the river. The width of the area of destruction was 300–400 m on the left side of the river and 500–700 m on the right side. Similar floods have not occurred on this river during the past 60–70 years. The floods on the Janshigow and on rivers east of the Kucha River were caused by heavy rain showers over an area extending from Kucha River to the city of Karashahr. On Aug. 12, 45–65 mm of rainfall were recorded; most of the rain fell in 2–3 hrs. The principle cause

of this destructive flood was the saturation of the soil by rainfall during preceding days. *Subject Headings:* **1. River floods 2. Flood damages 3. Kucha, Sinkiang.**—*I.L.D.*

12.5–358 551.513.2:551.577.32:551.577.38(521.4)

Tomioka, S., **Drought in Hokuriku District during Bai-u season in 1958.** *Journal of Meteorological Research*, Tokyo, 11(6):502–506, June **1959.** 5 figs., table. In Japanese; English summary p. 502. **DWB, DLC**—Monthly total precip. for June, 1958 at several stations in Hokuriku District was only about half of normal, and all over Japan the precip. in the Bai-u season of 1958 was remarkably less than normal. In order to clarify the cause of drought above-mentioned, the author tried a synoptic analysis on a large-scale area, giving attention to westerlies, upper anticyclone and stationary warm air mass, and obtained the following results: (1) westerlies did not advance southwards so remarkably as normal, but easterly field was predominant; (2) there appeared a remarkable trough, while cold air mass was weak; (3) stationary anticyclonic cell over Japan brought about a spell of drought in 1958. *Subject Headings:* **1. Synoptic analysis of drought 2. Bai-u circulation 3. Hokuriku District, Japan.**—*Author's abstract.*

RAIN, SNOW AND HAIL (551.578)

See also: **Formation of snow cover** (Kuz'min), 12.5–6; **Notes on Antarctic met.** (Prudhomme), 12.5–33; **Snow accumulation, Adélie Land** (Cornet et al.), 12.5–34; **Snow beams and abutments** (Stearns), 12.5–88; **Glaciological-meteorological research in Ötztaler Alps** (Hoinkes), 12.5–174; **Behavior patterns of hailstorms, New England** (Donaldson et al.), 12.5–197; **A half century of snow obs., Switzerland** (Mercanton), 12.5–198; **Snow surface evap., W. Siberia** (Moisenko et al.), 12.5–325; **Freezing nucleus concentrations** (Bigg), 12.5–330; **Coalescence between plane snow crystals** (Higuchi), 12.5–332; **Drop size distribution** (Mason, Andrews), 12.5–336; **Average winter and spring snow cover, French Alps** (Fontaine), 12.5–400; **Electrified snow and ball lightning** (Zalesskiĭ), 12.4–412.

12.5–359 551.578.1/4:551.594.25:621.396.67

Magono, Choji and Takahashi, Tsutomu (*both, Hokkaido Univ., Sapporo*), **The electrification of antennae by snow and rain falls.** *Journal of Meteorology*, Boston, 16(4):388–392, Aug. **1959.** 11 figs., 4 refs. **DWB, DLC**—It was observed that antennae were electrified during heavy snowfalls and that their potential reached several thousand volts at Mt. Teine. The electrification of the antennae was also observed during rainfalls at Sapporo. From further observations and experiments, it was concluded that the falling snow particles or rain drops play the part of an ion collector. *Subject Headings:* **1. Static electrification 2. Electricity of precipitation.**—*Authors' abstract.*

12.5–360 551.578.11:531.52

Panchev, St., **Opredelenie skorosti padeniia rastushchikh cherez gravitatsionnuiu koagulіatsiiu oblachnykh kapel'.** [Determination of the falling speed of cloud drops growing through gravitational coagulation.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 4, 624–628, April **1959.** 3 tables, 10 refs., 23 eqs. **DLC**—Formulas for the velocity of droplets growing through coagulation are derived on the basis of the following assumptions, viz: (1) a large water drop falling through a medium with immobile small cloud droplets, whose number is large enough so as to bring about an almost continuous increase of a large drop through gravitational coagulation; (2) hydrodynamic and other effects are neglected; (3) the temperature of the drop and of the medium are similar; and (4) the drops are spherical since the velocity of drops within the region $0.05 < Re < 1260$ is being considered. From the equation of motion $m' \frac{dV}{dt} + V \frac{dm'}{dt} = m'g + F_e$ (where V = velocity of falling drop, m' = mass of drop, and F_e = resistance of air) and $F_e = -\frac{\pi}{4} \eta r V(a + bRe)$ the author derives the formulas for the velocity of growing drops.

$$V=\frac{y}{2x}r^2-\frac{m^2(3m+5s)}{3n^2}y^2r^5+\frac{m^3(3m+5s)(6m+3s)}{9n^5}y^3r^8\cdots$$

$$V=\sqrt{\frac{8\rho_w g r}{7s+6m}}-\frac{6n}{11s+12m}\frac{1}{r}+\frac{9n^2(7s+6m)}{(2s+3m)(11s+12m)}\sqrt{\frac{7s+6m}{8\rho_w g}}\frac{1}{r5/2}-\cdots$$

The formula $V=\frac{r}{-x}+\sqrt{\frac{r^2}{x^2+yr}}$ gives the stationary velocity in the region examined. The computed velocities according to this formula are compared with measured terminal velocity and fall of drops in air and a good agreement is shown. *Subject Headings:* **1. Drop velocities 2. Cloud droplet coagulation.**—*I.L.D.*

12.5–361 551.578.41:551.574

Itoo, K. (*Met. Res. Inst.*), **On size-distribution of falling snow.** *Papers in Meteorology and Geophysics*, Tokyo, 7(1):29–33, April **1956.** 2 figs., table, 4 refs. **DWB**—Describes the observation of the size distribution of falling snow with the help of a condenser paper coated with the powder of water blue pigment. The results were accurate because the paper used was very thin (0.15 mm). On an average, the number of small snow flakes is greater than the larger ones. When there is a large amount of snowfall, equivalent water drops of snow flakes are 0.5 mm to 0.75 mm in diameter. *Subject Heading:* **1. Snowflake size distribution.**—*A.H.K.*

12.5–362 551.578.45(74)

One big snow stops wheels of U. S.: Defense, government, business skid to a halt. *U. S. News & World Report*, Wash., D. C., 44(9):33–35, Feb. 28, **1958.** photos. **DLC, DWB**—Pictures of snowstorm of Feb. 16, 1958 show vividly how one snowstorm retarded operations of our government, transportation and the whole economy, owing to over dependence on the automobile for transportation. Cost ran into hundreds of millions of dollars as sales and production dropped. Railroads were tied up not only so much by snow but by circuits in electric locomotives caused by wind driven snow. Dairy farmers had to dump milk worth a million dollars. Florida vegetables and fruits froze and tourist trade fell off. Zero temperatures were felt as far south as Alabama and there were 500 deaths attributable to the weather. Depths were up to 60 inches in New Hampshire, 54 in. in Michigan City, Indiana; 19 in. in Boston; 14 in. in Washington, D. C. In the future the air warning broadcast system will be used to warn against storms and floods. *Subject Headings:* **1. Record snowstorms 2. Snowstorms, Northeastern United States (Feb. 1958) 3. Northeastern United States.**—*M.R.*

12.5–363 551.578.45:551.574.42

U. S. Weather Bureau, **Snow and ice storm, Dec. 25–29, 1959: a preliminary report and the special weather bulletins issued.** Wash., D. C., Jan. **1960.** 8 p. chart. **DWB** (M78.4 U587sno)—Between Dec. 23–29, 1959 the U. S. was visited by a devastating storm that spread from the California coast, over the Rockies and on to the eastern seaboard. It carried with it snow, sleet, fog and freezing rain. Various weather bulletins issued by states are contained in this report. As the storm center moved from the Missouri-Iowa border through Indiana and New Jersey, it finally became weakened in its course east-northeastwards and eventually died out on reaching areas south of Cape Cod, Mass. Clayton, N. Mex., had 8–10 in. of snow while Lake Superior's waves rose up to 20 ft. *Subject Headings:* **1. Snowstorms, United States (Dec. 1959) 2. United States.**—*N.N.*

12.5–364 551.578.46:551.43(234.41)

Capello, Carlo and Luchino, Marta, **Recherches sur la limite temporaire des neiges dans les Alpes Occidentales italiennes.** [Studies on the temporary snow line in the Italian Western Alps.] *Germany. Deutscher Wetterdienst, Berichte*, 8(54):129–131, **1959.** fig. French, German and English summaries p. 129. **DWB, DLC**—In this report the authors tell the results of their studies on the variations in heights of the temporary snow-line in the Italian Western Alps. Among others the conclusions concerning the speed in going up and down of the snow line in the various seasons is of particular interest: the snow line goes down at a speed of 160 m

in height a week in autumn and goes up at a speed of 110 m a week in springtime. The variations in height depend on anomalies due both to the quantity of snowfall at the various levels and to the orographic conditions. *Subject Headings:* **1. Snow line variations 2. Snow line height determinations 3. Italian Western Alps.**—*Authors' abstract.*

12.5–365 551.578.46

Williams, G. P., **Field determination of free water content in wet snow.** *Western Snow Conference, 1956, Proceedings*, 24:16–20, Oct. 1956. 4 figs., 10 refs. **DWB** (M06 W527p)—A field method of determining the free water content of snow by measuring the density to which wet snow can be compacted was investigated. Experimental tests show that there is a good relationship between free water content and compacted density especially for settled and coarse spring snow and for water contents above 5%. It is considered that the main value of taking compacted densities will be to give information on the physical structure of wet snow during tests. *Subject Heading:* **1. Water content of snow pack.**—*Author's abstract.*

12.5–366 551.578.462:551.573

Martinelli, M., Jr. (*U. S. Dept. of Agric., Forest Service, Fort Collins, Colo.*), **Moisture exchange between the atmosphere and Alpine snow surfaces under summer conditions (preliminary results).** *Journal of Meteorology*, Boston, 17(2):227–231, April 1960. 2 figs., 4 tables, 9 refs. **DWB, DLC**—In order to determine how much of the summer ablation of Alpine snowfields was caused by evaporation, known quantities of snow were exposed to the atmosphere in two types of plastic containers. A net gain of moisture was measured at the snow surface during Aug. 1957. A net loss was measured during the first half of July 1958. The diurnal trend was for condensation at nights, evaporation in mornings, and either evaporation of condensation in the afternoons, depending on weather conditions. Shading the snow reduced melt during daylight hours, but increased melt after dark. Poor agreement was found between moisture exchange as computed from Sverdrup's equation and measured values. *Subject Headings:* **1. Snow cover ablation 2. Evaporation from snow cover.**—*Author's abstract.*

12.5–367 551.578.71/2(773)

Stout, G. E.; Blackmer, R. H. and Wilk, K. E. (*all, Ill. State Water Sur. Div. Urbana*), **Hail studies in Illinois relating to cloud physics.** *American Geophysical Union, Geophysical Monograph*, No. 5:369–383, 1960. 13 figs., table, 8 refs. **DWB, DLC**—Three independent hail studies during the past year have provided considerable basic knowledge concerning Illinois hailstorms. Analysis of climatological records from 85 stations indicates marked spatial and seasonal differences in frequency of hailstorms within the State. Considerable variability also occurs from year to year and decade to decade. One hundred eighty days with hail which caused damage to crops during 1953–1957 have been studied using insurance records or crop-loss, radar, and synoptic data. The crop-loss data were plotted to determine the time, location, and areal extent of the hailstorms. Variations in hail intensity (percent of crop damage) were also examined. Detailed case studies of the most significant hailstorms were made using radar and severe local storm volunteer observer data. It was found that distortions in squall lines corresponded closely with areas of greatest hail and wind occurrence. A case of hail formation in advance of a squall line was examined. Radar and rawinsonde data were used to formulate an hypothesis of the advanced hail formation process. *Subject Headings:* **1. Hail studies 2. Hail occurrence 3. Radar hailstorm studies 4. Illinois.**—*Authors' abstract.*

12.5–368 551.578.71

†Appleman, H. (*Air Weather Service, Scott AFB. Ill.*), **An investigation into the formation of hail.** *Nubila*, Verona, Italy, 2(1):28–37, 1959. 8 figs., 15 refs. Italian summary p. 28.—Available American data indicate that great instability alone is not a sufficient condition for the formation of true hail. Instead it appears as if a natural hail-suppression mechanism exists that is most active in the very season of greatest instability (summer) and in the coastal regions. Somewhat surprisingly, the hail-suppression mechanism appears to have no corresponding effect on thunderstorms. A study of this apparent paradox lead to a theory of hail formation which proposes that hailstones form primarily on those cloud droplets that are large

enough to grow to precipitation size by coalescence but that do not fall out before freezin Early fallout, and hence the suppression of hail, results from the existence of a thick, den cloud layer below the large-droplet freezing level. *Subject Headings:* **1. Hail formation 2. H suppression.**—*Author's abstract.*

12.5–369 551.578.

Beckwith, W. Boynton (*Met. Dept., United Air Lines, Denver*), **Analysis of hailstorms the Denver network, 1949–1958.** *American Geophysical Union, Geophysical Monograp* No. 5:348–353, **1960.** 9 figs., 2 tables, 7 refs. **DWB, DLC**—Data collected during 225 ha days over the past ten years are investigated. The synoptic and thermodynamic conditio associated with hail development are analyzed and comparisons are made between storms this area and those of the Middle West and Alberta. Upper wind distribution and the positic of the tropopause are related to the development and growth of hailstorm-producing cel *Subject Headings:* **1. Hailstorm data 2. Hailstorm analysis 3. Synoptic conditions for hai storms 4. Denver, Colo.**—*Author's abstract.*

HYDROMETEOROLOGY

See also: **Sec. F4,** p. 917; **Irrigation of sugar beets and potatoes** (Cavanillas Rodríguez et al.), 12.5–72; **Neutron moisture meter** (Marais, Smit), 12.5–73; **Heat balance of forest** (Rauner), 12.5–80; **Dependence of evaporation on availability of moisture** (Covey), 12.5–321; **Water budgets of two adjacent reservoirs, Hanworth, Eng.** (Edwards), 12.5–322; **Thermal boundary layer in flow through a porous medium** (Wooding), 12.5–327; **Mean precip. and specific drainage values for Danube catchment** (Újvári), 12.5–351; **Precip. deficit, Ukraine** (Astakhova), 12.5–352; **Flood, Kuchow** (Kuznetsov), 12.5–357; **Periodicities of annual runoff** (Andreianov), 12.5–377; **Classification of W. Siberia according to moisture and heat availability** (Mezentsev), 12.5–386.

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

See: **Greenland Ice Cap investigations** (Fristrup), 12.5–30.

CLIMATIC ZONES (551.581)

See: **Climat. zones of viticulture, U.S.S.R.** (Davitaia), 12.5–8; **Improved standard values of global radiation** (Collmann), 12.5–284.

CLIMATE OF PARTICULAR PLACES (551.582)

See also: **Climate, Kazakhstan** (Uteshev), 12.5–11; **Climate, Central Asiatic U.S.S.R.** (Balashova et al.), 12.5–12; **Climate, relief and atmos. pollution, Sheffield** (Garnett), 12.5–246.

12.5–370 551.582(474.5)(09

†Griciute, A. and Styra, B., **Lietuvos klimato tyrimas ir ateities perspektyvos.** [Recen state of the Lithuanian climate research and the future prospects.] *Lietuvos TSR Moksl Akademija. Geologijos ir Geografijos Institutas, Geografinis Metraštis,* 1:23–31, **1958.** 62 ref Russian and English summaries p. 28–29. —The article deals with the main stages of the histor of Lithuanian climate research. The pre-Soviet and Soviet periods are distinguished. Re cently, in Lithuania was published a great number of studies on the Lithuanian climate carrie out by classical, dynamic and complex research methods. A short analysis of separate work is given in the article. *Subject Headings:* **1. Climatological research 2. History of climatolog 3. Lithuanian S.S.R.**—*Authors' abstract.*

12.5–371 551.582.2(689.1

*Rhodesia and Nyasaland. Meteorological Service, **The climate of the Sabi Valley, Souther Rhodesia.** Its *Climate Information Sheets,* No. 8, March, **1959.** 4 p. 2 tables—The Sab

Experimental Station (lat. 20°21′, long. 32°20′, alt. 1450′0″) is located on the banks of Sabi River, in the wide flat alluvial plain. It is described in detail. Throughout the year the station experiences great heat. Even the coolest months have a maximum temperature of about 90°F. During the hottest months temperatures exceed 95°F. At night the minima averages of 67–68°F are recorded. Relative humidity at the station is from moderate to low, ranging from 78 at 6 a.m., 56 at 8 a.m. to 30 at 2 p.m. during Sept. when humidity is lowest. When it is highest in Feb. the ranges are 93, 78 and 54 at the respective observation time. Evaporation occurs freely. Average rainfall is about 22 in. at the station. Ten miles east of the station, it averages 40–50 in. There is an abundant sunshine. A south to southeasterly airstream, "the Guti weather," invades the area with cool moist air during the hottest months. Wind speeds are generally low except during the rainy season when thunderstorm squalls induce high wind speeds for a while. The windiest months are Sept., Oct. and Nov. and their main directions are southerly and northerly. *Subject Headings:* **1. Climate of Sabi Valley 2. Sabi Valley, Southern Rhodesia.**—*N.N.*

12.5–372 551.582.3:551.526.6(265.4)

Hakodate, Japan. Marine Observatory, **The charts of the mean surface water temperatures in the neighbouring Sea of Japan, (1911–1940).** Its *Bulletin*, No. 5, [Contribution No. 7], Dec. **1958.** Reprinted from unidentified source p. 67–74. 8 p. 12 figs. In Japanese; English summary p. 67. **DWB** The charts have been derived from observations taken on Japanese ships during a period of thirty years from 1911 to 1940. The mean values are calculated for each unit degree square and for each month at the Kobe Marine Observatory. In the charts, upper figures are monthly mean values, and lower figures are totals of observations in each unit area. *Subject Headings:* **1. Sea surface temperature charts 2. Water temperature data 3. Sea of Japan.**—*Author's abstract.*

12.5–373 551.582.3:551.553.6/8(47)

Sokhrina, R. F., **Opyt postroeniia kart chisla dneĭ s sil'nym vetrom dlia Tsentral'nykh oblasteĭ Evropeĭskoĭ chasti Soiuza i raĭonov osvoeniia tielinnykh i zalezhnykh zemel'.** [Attempt at constructing a chart of the number of days with strong winds in the central regions of the European U.S.S.R. and in regions of reclaimed virgin and fallow land.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 64(126):5–12, **1956.** 2 figs., 4 tables. **DWB**—Intense winds defined as winds whose velocity attains or exceeds on exchange of 15 m/sec over 2 minute intervals (regardless of whether the wind is recorded at the fixed observation period or between such periods) are of considerable economic importance. But the analysis of the frequency of such winds is rendered difficult owing to the non-uniformity of the observation series and their incomparability. In this study the author analyzed the numerical material on intense winds taking into account the location, (including relief and vegetation of the locality) of the stations and such wind characteristics as mean velocity, frequency of velocities of 11–15 m/sec and $\geq$15 m/sec, maximum velocity and number of days with intense winds and elevation of station above sea level. Isolines on maps for the area investigated were in most instances made on the basis of data from stations under open conditions. Cartographic analysis shows a dependence of the number of days with intense winds upon atmospheric circulation, and large scale physical geographic features. Patches with increased or diminished frequencies of intense winds are the result of interaction of circulation conditions with small scale physical geographic conditions. In verifying the above analysis it was found that stations with a small number of days with intense winds are in some cases of a higher class than stations with large number days with intense winds. Hence a small number of days with intense winds is not always associated closely with local conditions. Among stations of the same class the number of days with strong winds, annual temperature, amplitude, etc. differ considerably. This indicates that in the analysis of intense winds not only the degree of sheltering of the station but also the features of the landscape can produce an entire difference on the climates regime. Two maps showing the number of days with intense winds for the central regions of European USSR and for the regions of exploitation of virgin and reclaimed lands are presented. *Subject Headings:* **1. Wind speed charts 2. Strong wind frequencies 3. Atmospheric circulation 4. Topographic influences 5. European U.S.S.R.**—*I.L.D.*

VARIATIONS OF CLIMATE (551.583)

See also: **Hypsographic curve** (Lagrula), 12.5–176.

12.5–374 551.583:577.4

†Crisp, D. J., **The influence of climatic changes on animals and plants.** *Geographical Journal*, London, 125(1):1–19, March **1959.** 6 figs., numerous refs.—The article discusses data concerning the distribution of animals and plants in Northern Europe as influenced by climatic changes. The discussion covers different levels of biological life such as, plants, birds, mammals, insects, marine animals. Charts (Figs. 1, 2, 3, 5) illustrate the distribution of various species. It is concluded that changes attributable to climatic ameliorations are of moderate extent and confined to the far north. Mechanism by which changes are produced may be direct or indirect. In the first case, environment has a direct influence and in the second climatic changes influence the balance within a community of animals whose members react differently to it. *Subject Headings:* **1. Climatic effects on plant life 2. Climatic change influences on living things 3. Climatic variations.**—*I.S.*

12.5–375 551.583:312.8

†Manley, Gordon (*Dept. of Geography, Bedford College, Univ. of London*), **The revival of climatic determinism.** *Geographic Review*, N. Y., 48(1):98–105, Jan. **1958.** 26 foot-refs. **DWB, DLC**—The author reviews critically recent studies dealing with the role of climate in human history, such as the effect of climate upon the growth and decline of population, its effect upon agriculture and hence upon national economies, its possible role in the rise and fall of civilization, etc. The discussion includes an evaluation of E. Huntington's concept of climatic determinism, the decline of this concept and its revival in the work of Arnold Toynbee, and Markham's concept of the interrelationship between climate and the energy balance displayed by meteors. A detailed analysis is presented of Gustav Utterström's paper **Climatic fluctuations and population problems in early modern history** (*Scandinavian Econ. Hist. Rev.*, 3:3–47, **1957**; *see* 9.10–275, Oct. 1958, *Met. Abs.*) in which it is suggested that the increase in the population of Sweden in 1720–1735 is the result of mild winters and early springs. In other papers the author attributes the economic depressions in Europe in the fifteenth and sixteenth centuries to unfavorable weather conditions causing crop failure. The operation of the climatic factor is decreased hypothetically in the light of climatological data on the succession of bad or good climatic years. *Subject Headings:* **1. Climatic variation effects on human activity 2. Climatic determinism.**—*I.L.D.*

12.5–376 551.583.13

*†Galakhov, Nikolaĭ Nikolaevich, **Izuchenie struktury klimaticheskikh sezonov goda.** [Study of the climatic structure of the seasons.] Moscow, Akademiia Nauk SSSR, **1959.** 181 p. 31 figs., 77 tables, bibliog. p. 175–181. **DWB** (M83.13 G146iz)—In this monograph on the structure of the climatic season, the author attempts to establish the national boundaries of the annual seasons and their internal subdivision on the basis of the phenomena determining them, a possible complete and many-sided characterization of the phases of the annual seasons in relation to their climatic components and to explain the fundamental characteristics of the climatic seasons by means of periodic phenomena of nature. This study deals with the structure of the seasons over the central region of European U.S.S.R. and Eastern Siberia. A comprehensive review is presented of the literature dealing with the division of the year into seasons, the criteria for establishing seasons and their limits, the characteristics of the atmospheric circulation as a basis for the definition of seasons, the relation between climatic and calendar seasons, etc. The structure of the climatic seasons was analysed by means of a systematic analysis of the radiational and circulational conditions of climate formation and the conditions of the underlying surface, the variation of the climatic elements and the parallel development in organic nature. The radiation factor was examined on the basis of actinometric observations and the circulation conditions were classified on the basis of the circulation patterns of B. L. Dzerdzeevskiĭ and the secular calendar types of V. M. Kurganshaia. The structure of the climatic seasons of the U.S.S.R. outside the central regions of the U.S.S.R. and Eastern Siberia was analyzed by means of the thermal regime (atmospheric temperature) and its

seasonal characteristics. A detailed analysis is presented of the structure of winter, spring transitional season, summer and of the fall transition season. Extensive data are presented in tables, graphs and isoline maps. *Subject Headings:* **1. Climatic seasons 2. Temperature regime 3. Seasonal trends 4. Seasonal variations 5. U.S.S.R.**—*I.L.D.*

12.5–377 551.579:551.482.2:551.583.14

†Andreianov, V. G., **Tsiklicheskie kolebaniia godovogo stoka i ikh uchet pri gidrologicheskikh raschetakh.** [Periodicities of annual runoff and their use in hydrological calculations.] *Leningrad. Gosudarstvenyĭ Gidrologicheskiĭ Institut, Trudy,* No. 68:3–49, **1959.** 12 figs., 3 tables, 45 ref., 20 eqs. **DWB**—The works of different investigators of the periodicity of annual variations in runoff are briefly reviewed from 1741 to 1957 regarding the climatic factors and solar activities (Wolf's number). These problems are discussed in details and with graphically recorded data. Various methods of recording are discussed including consideration of the effects of solar activity for average 5, 10 and 15 years periods. Computations of norms for annual runoff and other hydrological and meteorological characteristics are discussed with regard to probable errors in computation. The arithmetic mean and center of distribution are statistically determined with the variation and assimilation coefficients and integral curves, indicating accidental values. The results of numerous investigations of several year's variations in the runoff in different rivers (Volga, Oka, Kama, Dnieper, Desna, etc.) and lakes (Caspian Sea) for 1899–1951 are statistically analyzed with the integral curves for total deviation from average values. The interpretation of the periodicity of the annual runoff by various investigators are reviewed and compared with the author's computed data for precise determination of their norms. The salient points of various problems are summarized in the conclusion. *Subject Headings:* **1. Runoff regime 2. Runoff data 3. Runoff forecasting 4. Hydrologic analysis.**—*N.P.S.*

12.5–378 551.583.14:523.746

Nagao, T., **Similarity between singularity and climatic variation, Pt. 1.** *Journal of Meteorological Research,* Tokyo, 11(10):809–821, **1959.** 12 figs., 7 eqs. In Japanese; English summary p. 809. **DWB, DLC**—In this paper the secular variations of three elements such as pressure, temperature and precipitation in June accompanied by the increase or decrease of annual mean sunspot numbers are discussed from the standpoint of frequency climatology. The results are as follows: (1) the variation of monthly average pattern accompanied by the variation of sunspot numbers is nearly analogous to that of the singularity with respect to the three elements; (2) the frequency distribution of daily mean temperature during 1901–1910 and 1921–1930 is also analogous to that of the singularity; (3) the distribution of precipitation amount per single rainy day is also explained using our theory on the singularity; (4) the variation of weather situation in June accompanied by the increase or decrease of sunspot numbers is approximately similar to that of the singularity. *Subject Headings:* **1. Secular climatic variations 2. Sunspot numbers.**—*Author's abstract.*

MICROCLIMATOLOGY (551.584)

See also: **Ecoclimat. of Dutch lights** (Jackson), 12.5–76; **Air temp. and humidity of cultivated fields** (Muminov), 12.5–77; **Heat balance in deciduous forest** (Rauner), 12.5–79; **Measurements in forests, Sarajevo** (Handžić), 12.5–81; **Forest and climate** (Fel'dman), 12.5–82; **Modification of phenological data by climate** (Simonis), 12.5–202; **Use of thermoelectric recording apparatus in microclimatic research** (Lützke), 12.5–212; **Precip. measurement in apple orchards** (Hoffmann), 12.5–349.

12.5–379 551.506:551.584

*Franceschini, Guy A., **Micrometeorological observations over non-ideal surfaces.** Texas A. & M. College, Dept. of Oceanography and Meteorology, Contract AF 19(604)-2250, Scientific Report No. 1, Dec. **1959.** 190 p. Almost entirely tables. **DWB**—Results of micrometeorological observations made at seven different locations in Texas are presented. The observations, taken on a 1 or 2 hourly basis, include measurements of the following eight variables: solar and sky short-wave radiation (insolation), surface-reflected shortwave radia-

tion, net radiation, air temperature and dew-point temperature at eight double-levels to a height of 16 m, wind speed at seven double-levels to a height of 16 m, wind direction at 16 m, and soil temperature at six levels to a depth of 1 m. Simultaneous auxiliary data, which include standard hourly surface weather observations and 6-hourly slow-rising pibals to 920 m, are also presented. Observations were made during nine periods at seven different locations. These sites represent a variety of vegetal coverage and soil types. The nine observation periods, made between Aug. 1957 and Aug. 1958, took place during different meteorological situations. For completeness of this report, a description of each observation site, and a brief summary of the synoptic situation during each period is given. Included with the site descriptions are computed values of surface reflectivity (albedo), and determinations of soil moisture for 10 cm layers to a depth of 1 m. The observations system and data reduction method are discussed briefly. Rreference is given which presents a more complete treatment of equipment and instrumentation used. *Subject Heading:* **1. Micrometeorological observations.**—*Author's abstract.*

12.5–380 551.584:06.045

Sapozhnikov, A. A. and Sapozhnikova, S. A., **O deiatel'nosti rabocheĭ gruppy VMO po mikroklimatologii.** [The activity of the WMO working group on microclimatology.] *Meteorologiia i Gidrologiia*, Leningrad, No. 7:58–59, July **1959. DWB, DLC**—Five members of the World Meteorological Organization (WMO) formed a working group on three major problems concerning: 1) study of researches made on the microclimatology and its practical use, 2) preparation of the "Manual" (handbook) on practical climatology and 3) study of the climatological methods applied in agriculture. *Subject Headings:* **1. WMO working group on microclimatology 2. Micrometeorology.**—*N.P.S.*

12.5–381 551.584.1

†Maruyama, Eizo, **Micrometeorology.** *Japan. Meteorological Agency, Weather Service Bulletin* (*Sokko Jiho*), No. 24:365–370, **1957.** In Japanese. Transl. into English issued by Morris D. Friedman, Inc. 67 Reservoir Street, Needham Heights, Mass., as its M-121. 10 p., fig., 103 refs. Transl. available **DWB** (M84.1 M389mi)—Micrometeorology of wind and frost damage on the evapotranspiration of plants is reviewed from previous reference works of several investigators in Japan on agricultural micrometeorology. Temperature, winds near the surface of the ground and experiments on raising water temperature and the means of counteracting frost disaster are discussed. *Subject Headings:* **1. Agricultural microclimatology 2. Micrometeorological wind profiles 3. Frost protection.**—*W.N.*

12.5–382 551.584.2:551.509.31

Bleeker, W., **Meso-analysis.** *Berlin. Freie Universität. Institut für Meteorologie und Geophysik, Meteorologische Abhandlungen*, 9(1):225–226, **1960.** 3 figs. (fold). **DWB**—A series of maps have been analyzed in detail. In addition to the data plotted during the seminar, teleprinter reports available from the International Meteorological Teleprinter Network of Europe and data from logbooks of Israeli and Netherlands ships have been used for reaching the most reliable analyses. It is therefore possible that the mesoanalyses differ somewhat from the outer surface analyses of the same date and time. Isobars have been drawn for every millibar. The main object of the analyses was to show the thermal effects discussed in our first and second lecture. For this reason maps of 06.00 GMT have been selected, as in these maps the diurnal effect of the night-time cooling coincides with the effects which are a result of the winter situation. *Subject Headings:* **1. Mesoanalysis 2. Marine meteorological data 3. Micrometeorology.**—*Author's introduction.*

12.5–383 551.584.2

Böer, Wolfgang (*Hauptamt f. Klimatologie, Potsdam*), **Zum Begriff des Lokalklimas.** [The concept of local climate.] *Zeitschrift für Meteorologie*, Berlin, 13(1/6):5–11, Jan./June, **1959.** 4 figs., table, 15 refs. German, English and Russian summaries p. 5. **DWB, DLC**—After appreciating the importance of the local climate to bioclimatological, in particular balneological, research the author tries, taking into consideration the definitions as given by R. Geiger on the one hand and E. S. Rubinstein and O. A. Drosdov on the other, a clarification of the

conception of the local climate and its boundaries towards similar terms. The proposal is made to refer to a local-climatic, or mesoclimatic, space rather than to a local climate. Finally, attention is drawn to investigations on local climate and microclimate, in the sense of the climate "representing the average state and mean typical course of the entirety of climatic elements within a local-climatic space," still being not available. The results of such studies are, however, necessarily the prerequisite for further bioclimatological research. *Subject Headings:* **1. Mesoclimate 2. Microclimatological research 3. Bioclimatology 4. Balneology.** —*Author's abstract.*

12.5–384 551.584.2(436.3):615.834

*Steinhauser, Ferdinand (*Vienna*), **Das Klima des Salzkammerguts.** [Climate of Salzkammergut.] *Wetter und Leben*, Vienna, 10(8/10):119-131, 1958. 9 tables, 7 refs. **DLC** A comprehensive analysis of the climate of the Salzkammergut with particular reference to its value as a convalescence climate. The climate of this region is determined by (1) its location along the northern border of the Alps so that it is in the realm of the rain-bringing northwest and west winds (2) by the large number of lakes which meliorate the climate along the banks; and (3) by the mountains of the Salzkammergut itself which bring about an altitude zonation of climate. Extensive data are presented in tables on the seasonal precipitation amounts and days with at least 1 mm of precipitation at various stations, number of hours of precipitation for each month during May–Sept., mean monthly duration of sunshine in hours on rainy days and per cent probability that on a rainy day the sunshine duration exceeds 3 and 5 hours, snow conditions, including mean data of first fall, number of days with snow cover, maximum and mean maximum snow depths, per cent snow cover probability, sunshine duration in per cent of effective possible duration, mean frequency of "good weather," monthly mean air temperature, monthly mean water temperature, etc. A medical climatic evaluation of the climate of the Salzkammergut indicates that it is a moderately relaxing climate with gradiations according to altitude. *Subject Headings:* **1. Mesoclimatological data 2. Climatotherapy 3. Salzkammergut, Austria.**—*I.L.D.*

CLIMATIC CLASSIFICATION (551.585)

See also: **Conservation in humid tropics**, 12.5–3; **Snow surface evap. in steppe regions, W. Siberia** (Moisenko), 12.5–325.

12.5–385 551.585(94)(95)(728.7)

Blair, Walter Beale and Chambers, Jack V., **Analogs of Canal Zone climate in Australia and New Guinea (Canal Zone Analogs VIII).** *U. S. Quartermaster Research and Engineering Center. Environment Protection Research Div., Technical Report* EP-113, July **1959.** 26 p. 5 figs. (fold. in back), 9 tables, 15 refs. **DWB** (M86 U585t)—The climate of Australia and New Guinea is compared with that of two locations in the Canal Zone: Balboa Heights, representing the drier, leeward, Pacific side of the Isthmus of Panama, and Cristobal, representing the wetter, windward, Atlantic side. Areas of analogy of pertinent climatic elements and combinations of these elements are shown on maps. Areas of complete climatic analogy to each Canal Zone station are found in certain portions of the lowlands of New Guinea. Climates in Australia are not analogous with either Canal Zone station but some climatic elements, such as mean temperature of the warmest month, are comparable. Areas below 2000 ft in elevation either have analogy with Balboa Heights or Cristobal, or have wetter or hotter climates than these stations. Most of New Britain and the southern interior lowlands of New Guinea from the Gulf of Papua to the Arafura Sea, are high rainfall areas usually receiving over 200 in. per year; this is much more than Canal Zone station and therefore not analogous. The mountainous areas in New Guinea and in the neighboring islands are too cool for analogy with either Canal Zone station. Although there is scanty coverage of data for mean windspeed, mean cloudiness, and mean relative humidity for most of the area, stations which show analogy for temperature and precipitation criteria usually show at least local analogy for the other, less widely observed elements. *Subject Headings:* **1. Climatic analogs 2. Australia 3. New Guinea 4. Panama Canal Zone.**—*Authors' abstract.*

12.5–386 551.585.5(571):551.5

Mezentsev, V. S., **Raĭonirovanie Zapadno-Sibirskoĭ ravniny po priznakam uvlazhneni teploobespechennosti.** [Classification of the western Siberian plain according to moist and heat availability.] *Vsesoiuznyĭ Gidrologicheskiĭ S"ezd, Trudy* (of 3rd Conference, C 1957), Vol. 7, issued 1959. p. 91–98. 4 figs., 4 tables, 4 refs. **DWB** (M79 V985tr)—Crite of heat availability and humidity are used for determination of hydrological regions in West Siberian plains. Maximums and minimums of optimum related precipitation, total eva transpiration and turbulent heat exchange, are established. Their comparison to local con tions permits drawing of charts with isolines of average annual coefficients of humidity a heat availability, average annual deficits of evapotranspiration and heat energy sources a finally, of zones of equal humidity and heat availability. Five of these zones are establish *Subject Headings:* **1. Continental climates 2. Climatic classifications 3. Hydrologic regic 4. Moisture indexes 4. Siberia.**—*J. Němec.*

BIOCLIMATOLOGY (551.586)

See also: **Sec. B5,** p. 888; **Melioration effect as shown by relationships between harvests and evaporation deficit** (Savina), 12.5–71.

12.5–387 551.586:551.524:612.014.4(

Milevskiĭ, V. Iu., **Effektivnye temperatury na Evropeĭskoĭ territorii SSSR.** [Effect temperatures in the European U.S.S.R.] *Leningrad. Universitet, Uchenye Zapiski*, No. 2 175–185, 1959. 3 figs., 8 refs. **DLC**—An attempt is made to determine the distribution of diurnal normal effective temperature of the warm half year over the European territory of U.S.S.R. and the dependence of this distribution upon the three components of effect temperature (air temperature, wind velocity and relative humidity) and upon physical g graphic conditions (latitude, relief, etc.); to verify the applicability of the confort zone esta lished in the U. S. (17.2–21.7° net) and by M. E. Marshak in the U.S.S.R. (13.5°–18.0° net) conditions in the European U.S.S.R. and to characterize the heat sensibility of individu living in different physical geographical regions (L. S. Berg classification). Normal effect temperatures were determined on the basis of long period monthly mean 1300 o'clock val of atmospheric temperature, wind velocity and relative humidity for 95 stations in the Europe U.S.S.R. In the European U.S.S.R. effective temperature isolines are 6–10° lower than temperature because of the cooling effect of the air masses upon the human organism. F the purpose of medical climatology it is necessary to determine the warm period of the year the period with positive normal effective temperature at 1300 o'clock (and hence with me daily temperature above 8°C); in the northern European U.S.S.R. it continues from July–Au in the central European U.S.S.R. between 63 and 52°N lat. between May and Sept. and in t south from April to Oct. The most important factor determining the character of distributi of effective temperature is the air temperature; wind velocity may have predominating imp tance only in special relief conditions; effective temperature increases with decrease in latitu The variation of effective temperature is analogous to that of atmospheric temperature; t more marked variation of effective temperature in the east of the European U.S.S.R. as co pared with the west is the result of greater climatic continentality. In spring effective tempe ture is lower than in fall by 1° because of snow melt, which lowers air temperature. Duri May–Sept. there are observed two regions of homogeneous effective temperatures, viz: t triangle Minsk-Leningrad-Moscow and also along the axis of Volikov (in the upper reaches the Don and middle Volga), etc. The U. S. comfort zone of 17.2–21.7°ET never occurred May at 1300 o'clock; during the summer it appeared only in the southern zone when actua heat sensibility is rather high (in the central zone-comfortable); in Sept. this comfort zone h disappeared almost everywhere. The Marshak comfort zone of 13.5–18.0°, while correspondi to European conditions suffers from the fundamental defect that all the months do not inclu a series of regions whose effective temperatures are below 13.5° even though they are ful comfortable. Maps showing the isolines of effective temperatures of April at 1300 o'clock July at 1300 o'clock and of Oct. at 1300 o'clock and a table giving the mean effective temper ture at 1300 o'clock for each month from May–Oct. for various points in the U.S.S.R. a presented and the various zones of effective temperatures are discussed. *Subject Heading* **1. Comfort zones 2. Temperature effects on physiology 3. U.S.S.R.**—*I.L.D.*

12.5–388 551.586:551.524.36:591.34(758)

Love, G. J. and Goodwin, Melvin H., Jr., **The effect of natural winter temperatures on development of *Anopheles quadrimaculatus* in southwestern Georgia.** *Ecology*, Durham, N. C., 40(2):198–205, April **1959.** 4 figs., 10 refs. **DWB, DLC**—Observations were made on development of ova and larvae from a colonized strain of *A. quadrimaculatus* at natural winter temperatures in southwestern Georgia. No. ova hatched at temperatures below 50°F; 90% of first and second instar larvae were killed by temperatures of 45°F. The point of developmental zero for ova was calculated as approximately 47°F. Approximately 1500 hour-degrees above 47°F were necessary for hatching. Mean temperature of approximately 57°F was computed as the lowest temperature at which most first instar larvae would develop to the second instar. Mean temperature above 60°F was necessary for most second instar larvae to develop to the third instar. Under natural temperatures, the developmental time from ova to adult varied from 15 to 51 days. Adult *A. quadrimaculatus* were not produced until mean daily temperatures remained consistently above 60°F. When a mean temperature of 70°F was reached, development of larvae which had been retarded by low temperature advanced rapidly and adult mosquitoes from ova produced over a period of several days emerged simultaneously. This probably accounts for the explosive appearance of *A. quadrimaculatus* in the spring. *Subject Headings:* **1. Insect bioclimatology 2. Temperature effects on mosquito breeding 3. Mosquitoes 4. Georgia.**—*Authors' summary.*

12.5–389 551.586:595.72:551.551.5

†Rainey, R. C. (*Great Britain*), **Biometeorology and the displacements of airborne insects.** *International Journal of Bioclimatology and Biometeorology*, Leiden, Netherlands, Vol. 2, (Pt. 3), **1958.** 5 p. 2 figs., 34 refs. **DWB**—A discussion of some of the meteorological methods that have proven useful in the study of distribution and movements in space of locusts. A marked association is shown to exist between vertical distribution of locust swarms and vertical temperature gradient. Accelerometer recordings made from an airplane showed gusts nominally equal to 2 met/sec and up currents 1 met/sec at the upper part of a high flying swarm, so that gliding locusts in the upper part of the swarm encountered air currents strong enough to cause them to maintain height without muscular work at horizontal intervals averaging 150 m. The movements of locust swarms are associated with rainfall which is essential for breeding. The main breeding are characterized by scanty and erratic rainfall averaging 10–25 cm/year. Swarm movements, studied in relation to wind observations made with pilot balloons in the immediate vicinity of swarms, showed down-wind movements at a speed equal to, or less than, the corresponding wind speed; the direction of displacement of groups within a swarm is random. Locust swarms can be expected to move toward and accumulate in zones of convergence. *Subject Headings:* **1. Insect bioclimatology 2. Wind effects on locusts.**—*I.L.D.*

12.5–390 551.586:61

Mörikofer, W. (*Davos Physical-Met. Obs*), **Grundzüge der medizinischen Klimatologie.** [Outline of medical climatology.] Reprint from *Die Ärztliche Fortbildung*, Munich, 8(5): 186–189, May, **1958. DWB** (M86:616 M794gr)—Biological characteristics of various climatic elements are discussed, namely, long-wave radiation exchange, solar radiation, ultraviolet radiation, sky radiation, radiation dosage, cooling power, humidity, atmospheric pressure and density, chemical composition and electricity of the atmosphere. *Subject Heading:* **1. Medical climatology.**—*G.T.*

12.5–391 551.586:61:061.6(492)

Tromp, S. W., **Review of bioclimatological studies carried out at the Bioclimatological Research Centre at Leiden (Netherlands).** *Československá Akademie Věd, II Ceolstátni Bioklimatologická Konference, Nov.* **3–5, 1958,** issued Prague, **1960.** p. 86–92.—The Bioclimatological Research Centre is an independent organization, created by the author in 1955, however administratively attached to the Department of Internal Diseases of the University Medical Centre at Leiden, Netherlands. It has at its disposal its own private Meteorological Station. The conditions for the study of the possible influence of weather and climate on human diseases are particularly favourable in the Netherlands because of its rapidly changing weather conditions during the year as a result of its location near the North Sea. Also the great number of depressions and weatherfronts passing over the country and the existence of a

climate boundary between the Eastern and Western part of the country make our country a interesting place for local and regional bioclimatological studies. Studies near the coast an further inland enable us also to compare the effect of different climates on the same type o disease. *Subject Headings:* **1. Bioclimatic research 2. Leiden, Netherlands.**—*Author abstract.*

12.5–392 551.586:612.014.4:551.521.12:551.508.98(261.3

Grimm, Hans, **"Abkühlungsgrösse" und Wärmestrahlung an der Ostseeküste in ihre Beziehungen zum Strandleben.** [Cooling powers and thermal radiation at the Baltic Se coast in relation to beach life.] *Zeitschrift für Meteorologie*, Berlin, 13(1/6):25–29, Jan./Jun **1959.** table 12 refs. German and English summaries p. 25. **DWB, DLC**—The behavio of visitors to the beach of Trassenheide (Usedom), i.e., frequency, rate of bathers and dabbler is put in relation to the cooling power (katathermometer) and to heat radiation (distillatio pyranometer). Knowing these stochastic relations, the readings of these simple instrument though not meeting the specific requirements of exact physiology and physics, still acquir some bioclimatological importance, and may be utilized for a consulting service to holida makers. *Subject Headings:* **1. Cooling power 2. Katathermometers 3. Pyranometer 4. Thermal radiation 5. Baltic Sea.**—*Author's summary.*

12.5–393 551.586:612.014.4(746

Hendrick, Robert L. (*Travelers Insurance Co., Hartford, Conn.*), **An outdoor weather comfort index for the summer season in Hartford, Connecticut.** *American Meteorologica Society, Bulletin*, 40(12):620–623, Dec. **1959.** 3 tables, 6 refs., 8 eqs. **DWB, DLC**—Tempera ture, relative humidity, wind speed and solar radiation are combined into a single numerica expression for outdoor weather comfort in Hartford. The use of this "Comfort Index" in radi weather broadcasts is discussed. *Subject Headings:* **1. Comfort indexes 2. Hartford, Conn.** *Author's abstract.*

12.5–394 551.586:612.

Giordano, Antonio (*Instituto di Radiologia, Università di Pavia*), **Fattori poco noti dell eritrosedimentazione rilevati con la tecnica differenziale.** [Little known factors of bloo sedimentation discovered by means of differential method.] *Geofisica e Meteorologia*, Geno 6(1/2):24–31, April **1958.** 2 figs. **DWB, DLC**—An analysis of the results of differenti blood sedimentation obtained between Sept. 2, 1957 and March 31, 1958, at four differen localities in north Italy. Experiments are summarized showing that screens and enviro mental temperature do not influence differential sedimentation. Metallic screens canno prove a pressure effect upon differential sedimentation rate except when the variation of pres sure is associated with ionic variation. The differential sedimentation can serve apparentl as an indication of the response of the organism to stress. Effects of sferics upon inorgani colloids, apparently exerting a net aiding effect upon sedimentation have been reported. Th screening effect of metallic screens of various metals upon diverse types of animal blood, th meteorology of the differential sedimentation technique, correlation of differential sedimenta tion with the *P* test and with the *K* index, etc., are discussed. *Subject Headings:* **1. Biometeoro logical experiments 2. Blood sedimentation 3. Weather effects on blood.**—*I.L.D.*

12.5–395 551.586:612.014.4

Berg, Hellmut, **Temperatur und Strahlung als Faktoren der Behaglichkeit im Gebirge** [Temperature and radiation as comfort factors in mountains.] *Germany. Deutscher Wetter dienst, Berichte*, 8(54):71–74, **1959.** 4 figs., 3 refs. German, English and French summarie p. 71. **DWB, DLC**—The author tries to fix the limits between the different degrees of feeling (cold, warm, comfortable) under the conditions of the wintry Algäu Alps (1300 m) as a functio of air temperature and direct solar radiation on a day of clear sky. There is a relation betwee the degree of feeling and the mean temperature of the finger-ends or the temperature of the forehead. With a certain feeling the temperatures of the finger-ends are lower compared t the results of Warmbt in Middle Germany. *Subject Headings:* **1. Comfort climate 2. Temperature effects 3. Solar radiation effects 4. Comfort sensation 5. Algäu Alps, Germany.**—*Author's abstract.*

UPPER AIR CLIMATOLOGY (551.587)

12.5–396 551.587:551.524.32(478)

Levin, A. G. and Mischikov, D. M., **Vesenii perekhod temperatury vozdukha cherez 0° v servo-vostochnykh raïonakh SSSR.** [Spring transition of air temperatures through 0°C in N.E. regions of the U.S.S.R.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 67: 148–152, **1958.** 5 figs., ref. **DWB**—The authors examined the problems of the relationship of the dates of stable transition of air temperature through 0°C with height of a locality and attempted to construct a "three dimensional" map of mean dates of transition for that part of the northeastern U.S.S.R. occupied by the basins of the Yana, Indigirka and Kolyma Rivers. They assume that independently of the general character of a spring, during advective or radional melting or late or early warming the distribution of dates of air temperature transition is nearly consistent from year to year. The transition of an air temperature through 0°C as a function of elevation and latitude was examined for a number of localities. It was found that this relationship obeys a curvilinear law with different degrees of curvature for individual districts. In each district T (date of transition) varies constantly with height from year to year so that generalized curves for various districts can be obtained. The forecast of T and the computation of the flood waters formation in mountain districts require the consideration of the actual movement of the zero isotherm for each year. The dependence of mean long period dates of T upon height of a station above sea level and latitude was computed for 58 stations and a map of mean dates of transition was constructed. Such a map for May is reproduced. *Subject Headings:* **1. Seasonal temperature variations 2. Spring temperatures 3. Temperature-height correlations 4. Upper air climatology 5. Eastern U.S.S.R.**—*I.L.D.*

ENVIRONMENTAL INFLUENCES (551.588)

See: **Forest and climate** (Fel'dman), 12.5–82; **Nocturnal temperature rises around a large city** (Berg), 12.5–292.

12.5–397 551.588.5:551.581:551.524.32(99)

†Wexler, Harry (*Chief Scientist US-IGY Antarctic Prog., Natl. Acad. of Sci., Wash., D. C.*), **The »Kernlose» winter in Antarctica.** *Geophysica*, Helsinki, 6(3/4):577–595, **1958.** 11 figs., table, 23 refs. **DWB, DLC**—The *IGY* meteorological observations in Antarctica enable further study to be made of a rather curious winter temperature phenomenon. During the earliest wintering-over expedition in Antarctica in 1898–99, meteorologists of the »Belgica» noted that in the cold season (March–Sept.), the curve of average monthly temperatures was quite flat, with one or more reversals of the expected seasonal trends, (Fig. 1) (Arctowski (3)). This phenomenon is further illustrated by the average monthly temperatures for 6 years of Little America data shown in Fig. 2, together with the average curve for Verkhoyansk, Siberia. We see that Little America has a flat winter minimum in contrast to the typically sharp polar continental minimum at Verkhoyansk. Five of the 6 years of Little America temperature data show the winter maximum in June; the preceding minimum is found in April for 3 years and in May for 3 years. *Subject Headings:* **1. IGY Antarctic program 2. Winter temperatures 3. Antarctic winter 4. Antarctica.**—*Author's abstract.*

SYNOPTIC CLIMATOLOGY (551.589)

See also: **Synoptic-climatological study of Arctic circulation** (Kunkel), 12.5–28.

12.5–398 551.589 551.515.8(282.244.3)

Blanchet, Guy, **Masses d'air et types de temps dans le Couloir Rhodanien.** [Air masses and weather types in the Rhone Valley.] *Germany. Deutscher Wetterdienst, Berichte*, 8(54): 197–202, **1959.** 7 figs. French, German and English summaries p. 197. **DWB, DLC**—A study on dynamic climatology of the Rhone valley. The importance of the maritime air masses (59% of the year as against 41%). Disturbances are by far more frequent than anticyclones (68% of the year as against 32%). The southwestern movement plays an essential role which causes yearly precipitations of 35–40% in the upper valley, nearly 50% in Lyons and 60 to 70% in the middle valley, the Cévennes and the southern Lower Alps. *Subject Headings:* **1. Dynamic climatology 2. Air masses 3. Rhone Valley.**—*Author's abstract.*

12.5–399 551.589 551.511.3:551.524.

†*U. S. National Aeronautics and Space Administration, **NASA reactor facility hazard summary, Vol. 1,** prepared by Lewis Research Center Staff, Cleveland, Ohio. Ed. by T. M Hallman and B. Lubarsky. Its *NASA Memorandum*, 12-8-58E, Jan. 1959. 384 p. numerou figs. (some fold.), tables, bibliogs. and eqs. throughout. "Report originally submitted t the Atomic Energy Commission in Oct. 1956 as the **NACA reactor facility hazards summary.**" **DWB** (629.1388 U584me) -Appendix C (p.159–166) of this large volume consists of a repor on the meteorological aspects of a proposed nuclear facility, prepared by the Scientific Service Division of the U.S.W.B. Climatological data for Sandusky, Ohio, for Dec. 1949–Nov. 195 are analyzed to show stability conditions (frequency of inversions and wind speed groups) *Subject Headings:* **1. Reactor hazard 2. Inversion frequencies 3. Sandusky, Ohio. I. Hall man, T. M.** (*ed.*) **II. Lubarsky, B.** (*ed.*).—*M.R.*

12.5–400 551.589.1:551.578.46(234.3

Fontaine, Paul, **Nouvelles données sur l'enneigement moyen d'hiver et de printemps dan les Alpes françaises: essai de schématisation des types de temps correspondants.** [New data on the average winter and spring snow cover in the French Alps; classification of the corre sponding weather types.] *Germany. Deutscher Wetterdienst, Berichte*, 8(54):203–208, **1959** 6 figs. French, German and English summaries p. 203. **DWB, DLC**—Data of snow for middl altitude collected weekly in the four main Alpine basins by the "Electricité de France" Hydro meteorological Service are used and snow cover provisional normals are calculated for winte and spring. The data for six years have been used. The results do not differ significantly from those already published at the Fourth Alpine Meteorology Congress (Chamonix Sept 1956) and which had been computed for a period of only four years. A statistical study of th various quality of the snow mantle is presented on the basis of information published by th French Winter Sports Stations Committee. For the same six years period it had been possibl to define, for winter and spring, six main weather types corresponding to continental, Atlantic Arctic and Mediterranean influences, to a circulation from the Atlantic to the Mediterranean and also to anticyclonic patterns with westerly winds. The frequencies of those variou weather types are determined in order to show the most probable weather types and thei effect on the snow mantle. The sequences of the weather types leading to above or belo normal snow cover years are also studied. *Subject Headings:* **1. Weather types 2. Snow cove depth 3. Snow cover data 4. French Alps.**—*Author's abstract.*

MISCELLANEOUS

COSMIC INFLUENCES (551.590)

See also: **Variation of heights of reflection points of meteor trails** (Weiss), 12.5–113.

12.5–401 551.590.21:541.4

Piccardi, Giorgio, **Le ricerche sui tests chimici durante l'Anno Geofisico Internazionale** [Research on chemical tests during the International Geophysical Year.] *Geofisica e Meteoro logia*, Genoa, 7(1/2):45–49, Jan./April **1959.** 2 refs. English summary p. 49. **DWB**— During the IGY, experiments with chemical tests have been carried out in several stations o the S. and N. Hemispheres in order to study the behavior of the chemical tests in relation to the solar hypothesis that the author formulated a few years ago. As the IGY was over, it ha been ascertained that also in the S. Hemisphere the annual variation of the *D* test could be observed and that it was contemporary to the variation observed in the N. Hemisphere. I has been ascertained that a large dissymmetry concerning the *F* test exists between S. and N Hemispheres. Proceeding from the equator to N, the figure of the *F* test response increase lightly but proceeding to S it decreases highly. The prevision on solar hypothesis has ther been fully verified. *Subject Headings:* **1. Solar influences on precipitation of chemicals 2. IGY research.**—*Author's abstract.*

VISIBILITY (551.591)

See: **Slant visibility measuring system**, 12.5–50; **Ceiling and visibility forecasting** (Munn), 12.5–52.

OPTICAL PHENOMENA (551.593)

See also: **Atmos. phenomena** (Zamorskiĭ), 12.5–9; **Optical instrumentation for missile testing**, 12.5–97.

12.5–402 551.593.5:551.575.1:535.43

Spencer, Domina Eberle (*Univ. of Conn., Storrs, Conn.*), **Scattering function for fogs.** *Optical Society of America, Journal*, 50(6):584–585, June **1960.** 3 figs., table, 3 foot-refs., 10 eqs. **DWB, DLC**—The paper summarizes recent experimental data on fogs. It is shown that a wide range of conditions from very light to very dense fogs can be represented by a single shape of scattering function. The scattering function $F(e)$ is defined graphically and by a table of values. Given this scattering function, the scattering coefficient of a fog can be defined in terms of the attenuation coefficient. *Subject Headings:* **1. Scattering function 2. Fog density 3. Optical density of fog.**—*Author's abstract.*

12.5–403 551.593.63(439.1)

Béll, Béla, **Összetett halojelenség Budapest fölött.** [Composite halo phenomenon over Budapest.] *Időjárás*, Budapest, 63(2):102–105, March/April, **1959.** 4 figs., 2 tables. **DLC**—Some details of composite halo phenomena, as observed at Aerological Observatory of Pestszentlorinc, March 19, 1959 between 9 and 11 local time, are presented. A survey of various phenomena of composite refractions of solar rays from ice crystals of clouds, fogs, and rain stripes, are analyzed. An uncolored horizontal circle crossing the sun was observed in details; in its whole extension between $10^h\ 45^m$ and $10^h\ 50^m$. A parhelion, red and blue colored at its edges, was sighted eastward of the sun constantly, moving from the sun-ring on its course at the horizontal circle. The grades of moving, as measured by a pilote-theodolite, are presented in one of the tables. Azimuths, altitudes of the sun; the parhelion's side-angles and azimuths from the sun are shown in a table and a diagram. The upper tangential arc on the sun-ring, showing first the familiar horny shape, then developing into an ellyptic bow of great curvature, was observed constantly. Azimuths and altitudes of the arc are graphically represented. The horizontal circle, the parhelions, the tangential arc, and the sun-ring disappeared successively after 11^h. The altitudinal wind at Cirrus-level, among other meteorological circumstances, showed interesting alterations: a SSE wind of 2–3 mps up to km in the troposphere was turning to WNW and then to NW above this level, increasing in strength, and becoming 26 mps at an altitude of 14–16 km above Debrecen. *Subject Headings:* **1. Halo phenomena 2. Budapest, Hungary.**—*O.T.*

12.5–404 551.593.63

Visser, S. W., **Een onbekend haloverschijnsel, de buitenrand van de kring van 22°.** [An unknown phenomenon, the outer rim of the 22° halo.] *Hemel en Dampkring*, The Hague, 55(12):228–231, Dec. **1957.** 3 figs., 4 tables. English summary p. 231. **DWB, DLC**—The voluntary observers of the Royal Netherlands Meteorological Institute repeatedly observed an outer rim of the 22° halo. During the 26 years, 1930–1955, 18 different observers (amongst them the author) noted this phenomenon on 21 days by observing stars in the neighborhood, whereas in 21 cases the width could be deduced from simultaneous star observations at both rims of the halo. Moreover, once the radii of the inner and the outer rim have been determined with the aid of an octant (22.1 and 24.0° respectively), the observations yield an outer radius of 24.7° and a width of 2.9°. We cannot doubt the reality of the phenomenon, but it is incompatible with the general theory of refraction. The phenomenon is explained by diffraction in the very small ice crystals through which the light falls. A preliminary research leads to the conclusion that indeed a general diffraction minimum occurs at a distance of 24.3° from the luminary in ice crystals with an apparent slit of 13μ (edge of the hexagonal base plane 0.017 mm). *Subject Headings:* **1. Halos 2. Netherlands.**—*Author's abstract.*

12.5–405 551.593.64:551.575(544)

Venkateswara Rao, D. and Mukherjee, A. K. (*both, Met. Office, Jodhpur*), **The formation and structure of a rare fog at Jodhpur.** *Indian Journal of Meteorology and Geophysics*, Delhi,

9(4): 341 344, Oct. **1958.** 2 figs., table, 8 refs., eqs. **DWB, DLC**—The meteorological conditions leading to the formation of a rare fog, which caused a spectacular lunar corona at Jodhpur in the early hours of 18 Jan. 1957, have been investigated. The observed reversal of the surface wind just before the development of fog is explained. The variation in the angular diameter of the red annulus of the lunar corona at different times showed that the fog was homogeneous soon after formation with a droplet diameter of 18.2μ. It is shown from the changes in the chromatic structure of the corona that the drop size increased rapidly with the aging of the fog but did not, however, exceed 50μ before its dissipation. *Subject Headings:* **1. Fog structure 2. Synoptic conditions for fog 3. Lunar coronas 4. Jodhpur, India.**—*Authors' abstract.*

12.5–406 551.593.7

California. Univ. at Los Angeles. Dept. of Meteorology, **Measurements of the skylight polarization during the period May–July, 1956.** Contract AT(11-1)-24, (Unnumbered Report) [1958?]. 18 p. 7 figs., 2 tables, 3 refs. Carbon of typescript. **DWB**—A continuation of the work reported to the Atomic Energy Commission in Nov. 1955, in which report a qualitative discussion on the particle size determinations deduced from sky light measurements made in Nevada during the same year was given. The present report deals with possible changes of turbidity of the atmosphere as a result of the nuclear test conducted in the Pacific during the following year. Measurements were made from the top of Palomar Mt. (33°18′30″ N.L., 116°50′53″ W long) at an elevation of 5620 ft. Geography and weather conditions at the observation site, the procedures on the measurements and the previous measurements are discussed and compared. A continued comparison of these theoretical results with the measurements will answer the questions whether, and to what extent, the observed changes of the sky light may be caused by the advection of atomic debris from the Pacific test sites. *Subject Headings:* **1. Sky light polarization 2. Polarization measurements 3. Nuclear explosion effects 4. Palomar Mt., Calif.**—*N.N.*

12.5–407 551.593.7

Tanaka, T.; Sekigawa, T. and Sato, T. (*all, Tokyo College of Science*), **On the height of the origin of the anomaly of the polarization of the light scattered from the atmosphere.** *Meteorological Society of Japan, Tokyo, Journal, Ser.* **2,** 36(6):209–216, Dec. **1958.** 11 figs., 3 refs., 13 eqs. **DWB, DLC**—The height of the origin of the anomaly of the polarization of the light scattered from the atmosphere was investigated. The polarizability was measured with two polarimeters at two sites, which are at a distance of about 20 km, at the same time as possible. Parallax seems to have been found, and a reliable value of the height was calculated. *Subject Heading:* **1. Polarization.**—*Authors' abstract.*

12.5–408 551.593.9

Hoffmeister, C., **Visuelle Beobachtung des Zodiakallichts als psycho-physiologisches Problem.** [Visual observation of zodiacal light as a psycho-physiological problem.] *Die Sterne,* Leipzig, 34(9/10):174–181, **1958.** 4 figs., 16 refs. **DLC**—The author describes the complex character of the phenomenon and asks the question: what is to be considered as zodiacal light? The answer to this question is given by William Brunner. He thinks that only diffuse light emitted by interplanetary material is to be considered as zodiacal light; all other phenomena in relation to the terrestrial atmosphere are to be placed in the geophysical field. *Subject Heading:* **1. Zodiacal light.**—*A. V.*

ELECTRICAL PHENOMENA (551.594)

See also: **Atmos. phenomena** (Zamorskiĭ), 12.5–9; **VLF propagation using atmos. wave forms** (Taylor, Lange), 12.5–69; **Transequatorial backscatter echoes** (Dueño), 12.5–70; **Solar eruption in whole light** (Waldmeier), 12.5–102; **Atmos. whistlers and radio radiation** (De Feiter), 12.5–116; **Geomag. trapped electrons from an artificial source** (Welch, Whitaker), 12.5–143; **Lifetimes of trapped radiation belt particles** (Wentworth), 12.5–144; **Ice crystal contact electrification** (Hutchinson), 12.5–333; **Electrification of antennae by precip.** (Magono, Takahashi), 12.5–359.

12.5–409 551.594.11

Kilinski, Erich V., **Der Tagesgang des luftelektrischen Potentialgefälles in Potsdam und seine Ursachen.** [The diurnal course of atmospheric electrical potential gradient at Potsdam,

and its cause.] *Zeitschrift für Meteorologie*, Berlin, 12(1/2):38–41, Jan./Feb. 1958. 4 figs., 8 refs., 11 eqs. **DWB, DLC**—The problem of the transformation of the diurnal atmospheric electricity gradient in Potsdam and in other continental stations, from a single wave in winter to a double wave course in summer, is examined. The concept of columnar resistance of the atmosphere and the deviation of a relationship for determining the daily variation of atmospheric columnar resistance is presented. The variation of the potential of the upper atmosphere was obtained by means of the equation $R = k(v_0/\lambda v)$ and the variation of vertical current from $i = (v/r)$ (where v = potential gradient; v_0 = oceanic potential gradient; r = partial resistance). The seasonal change in the diurnal variation is attributed to a change in the diurnal variation of the quotient of the specific resistance of the atmosphere at the ground and the columnar resistance. *Subject Headings:* **1. Diurnal potential gradient variations 2. Potsdam, Germany.**—*I.L.D.*

12.5–410 551.594.12 551.510.71

Kawano, M. and Nakatani, S. (*both, Electrotechnical Lab., Tokyo*), **The results of routine observations of the ionization and the natural radioactive dust concentration in the atmosphere in Tokyo, (preliminary report).** *Meteorological Society of Japan, Tokyo, Journal, Ser.* 2, 36(4): 135–140, Aug. **1958.** 9 figs., table, 5 refs. **DWB, DLC**—The ionizations by α-, β-, γ-rays and β-, γ-rays and the natural radioactive dust concentration in the atmosphere near the ground have been observed continuously at Tanashi, Tokyo, since April 1958. On fine days, the diurnal variation of the ionization by α-, α-, γ-rays is similar to that of the ionization by β-, γ-rays. The maximum value occurs at night (4∼6 h), and the minimum in the daytime (11∼13 h). On cloudy and rainy days, the time variations are very irregular and the values are considerably larger than those on fine days. On fine days, the values of $(\beta/\gamma)/(\alpha\beta\gamma)$ are about 2∼5 per cent, being large in the daytime and small at night, but the values on cloudy and rainy days are considerably smaller than those on fine days. According to the results of observations with an electrostatic precipitator the natural radioactive dust concentration is large at night and small in the daytime, and the diurnal variation being similar to that of ionization. But, the amplitude of the diurnal variation curve of the dust concentration collected with the electrostatic precipitator is remarkably larger than that of the ionization by β-, γ-rays measured with an ionization chamber. The results of simultaneous observations mentioned above seem to be important for the researches on the natural radioactivity and on the frequency distribution of the particle size of the radioactive dusts in the atmosphere. The abnormal increase of the ionization by α-, β-, γ-rays was found during the solar eclipse, 19 April, 1958. The maximum value occurred at the time of the maximum obscuration, and was over twice that on the other days. *Subject Headings:* **1. Diurnal ionization variations 2. Radioactivity of the atmosphere 3. Radioactive fallout 4. Tokyo, Japan.**—*Authors' abstract.*

12.5–411 551.594.253:551.574.1

Twomey, S. (*Div. of Radiophysics, C.S.I.R.O., Australia*), **The electrification of individual cloud droplets.** *Tellus*, Stockholm, 8(4):445–452, Nov. **1956.** 4 figs., table, 16 refs. **DLC**—The results of some observations of the electric charges carried out by individual cloud elements at the summit of Mt. Wellington, 1460 ft, near Hobart, Tasmania, in July 1955, are described. Measurable charges were found on many droplets, and a reversal of polarity was observed which appeared to be associated with the presence of ice particles. The different mechanisms of charging are discussed in the light of the experimental results, and reference is made to the possible significance of droplet electrification in the precipitation process. *Subject Headings:* **1. Electrification of droplets 2. Hobart, Tasmania.**—*Author's abstract.*

12.5–412 551.594.252:551.578.4:551.594.223

Zalesskiĭ, Iu. M., **Naelektrizovannyĭ sneg i sharovaia molniia zimoĭ.** [Electrified snow and ball lightning in winter.] *Priroda*, Moscow, No. 10:114, Oct. **1958.** **DLC**—During a snowfall consisting of rather large flakes which fell at a temperature of −3°C on Feb. 12, 1958, in Moscow, the author heard a crackling in the snow. It was particularly loud when the snow fell upon leaves of trees and pieces of paper lying in the street. At a height of 4 m the crackling snow flakes lighted up to form a reddish sphere, 2 cm in diameter. Without altering its height it slowly floated, resembling a large spark seen in a fire. This crackling indicates that the

snow was electrified and the electrification accounted for the crackle. While electrification of snow flakes is not unusual and it occurs during winter thunderstorms the appearance of the luminous sphere was unusual. *Subject Headings:* **1. Electrification of snow 2. Ball lightning 3. Moscow, U.S.S.R.**—*I.L.D.*

12.5–413 551.594.18:551.551.5

Israël, H. (*Met. Obs. des Deutschen Wetterdienstes, Aachen*), **Atmospheric electrical agitation.** *Royal Meteorological Society, Quarterly Journal*, 85(364):91–104, April **1959.** 15 figs., 2 tables, 30 refs. **DWB, DLC.** Also issued in *Conference on Atmospheric Electricity, 2nd, Portsmouth, N. H., May 1958, Proceedings*, issued **1958.** p. 149–160. 12 figs., table, 23 refs. **DWB** (M(055) C748pr). Summary in *Geofisica Pura e Applicata*, Milan, 42:140–142, **1959. DLC**—The paper shows the so-called 'agitation' of the atmospheric electrical elements in relation to atmospheric turbulence, and demonstrates in a series of examples the behavior of the agitation and its application to the analysis of atmospheric electrical processes. We can consider it as a further element in the coupling between atmospheric electricity and meteorology. It appears that the central significance of the coupling can be seen in the various atmospheric exchange processes and their different electrical effects. *Subject Headings:* **1. Atmospheric electricity agitation 2. atmospheric turbulence.**—*Author's abstract.*

12.5–414 551.594.221:551.576.1

Jones, R. F.; Chalmers, J. A.; Pierce, E. T. and Smith, L. G., [**Discussion of**] **L. G. Smith: Intracloud discharges.** *Royal Meteorological Society, Quarterly Journal*, 84(361):288, July **1958.** (For abstract on original article *see* 8.6–368, June 1957, *Met. Abs.*) **DWB, DLC**—A discussion regarding direction of intracloud discharges. Jones suggests that many intracloud lightning flashes are inclined rather than vertical as in L. G. Smith's model E. T. Pierce replies that 50% of the thunderclouds can be represented by a simple vertical dipole and that the remainder are too complicated for any simple model. L. G. Smith maintains that nearly horizontal cloud discharges are rare, although air discharges which are excluded from this study, are often observed to be horizontal. *Subject Headings:* **1. Intracloud lightning discharges 2. Lightning discharge fields.**—*M.R.*

12.5–415 551.594.223:778.3(477)

Davydov, B. V., **Redkaia fotografiia sharovoĭ molnii.** [An unusual photograph of ball lightning.] *Priroda*, Moscow, 47(1): facing p. 96, Jan. **1958. DLC**—The photograph of ball lightning was obtained in Kharkov during the night of Aug. 27, 1957. It shows two fine, even lines issuing from points projected to the channel of linear lightning. The photograph of the ball lightning and a diagram showing the trajectory of the ball lightning are presented. *Subject Headings:* **1. Ball lightning 2. Lightning photographs 3. Kharkov, Ukrainian S.S.R.**—*I.L.D.*

ACOUSTICAL PHENOMENA (551.596)

See: **Acoustical soundings of warm layer during IGY** (Facy), 12.5–23; **Velocity of sound in sea water** (Froese), 12.5–163.

PART II. UPPER ATMOSPHERE STRUCTURE 80 TO 300 KM

Compiled by: Elemer Kiss

INTRODUCTORY NOTE

This is the second in a series of compilations of references to literature on the structure of the upper atmosphere. The first publication, in the April issue of *Meteorological and Geoastrophysical Abstracts* contained items covering the 30–80 km altitude range. This issue is mainly concerned with the ionospheric region (80–300 km.). Data obtained by indirect methods include observations of airglow, aurora, meteor trails, etc. Direct observations were carried out with emphasis on rockets and satellites. The third compilation to be issued in June (No. 6) will present items treating the upper atmosphere above 300 km.

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1928

12E–1 551.594.5

*Vegard, Lars, **Nordlicht.** [Aurora.] (In: Wien, Wilhelm, **Handbuch der Experimentalphysik,** Vol. 25, Pt. 1, pub. Leipzig, **1928.** p. 385–476. 19 figs., 15 tables, 3 plates, refs., 33 eqs.) **DLC**—Auroral forms, height distribution, relation to geomagnetism, direction of arcs and draperies, diurnal, monthly and annual variation, secular periods, terrestrial and cosmic radiation theories, BIRKELAND'S experiments, STORMER'S computations, physical measurements, light distribution with height, auroral spectrum and the upper atmosphere, experimental verification of VEGARD'S hypothesis of aurora (bombardment of solid nitrogen with cathode rays produces typical auroral spectrum), night sky light and vertical temperature distribution in the upper atmosphere are the main topics discussed in his summary of scientific results. (*Same item as* 4J–64, Oct. 1953, *Met. Abs.*) *Subject Headings:* **1. Auroras 2. Origin of auroras 3. Experimental auroras 4. Vertical temperature distribution.**—*A. Assur.*

1932

12E–2 551.524.7:551.594.51

Vegard, Lars, **The temperature of the auroral region determined by the rotational series of the negative nitrogen-bands.** *Terrestrial Magnetism and Atmospheric Electricity,* Wash., D. C., 37(3): 389–398, Sept. **1932.** 4 figs., 4 tables, refs., 4 eqs. **DLC**—Describes preliminary experiments which led to quantitative determination of temperature of auroral region. From intensity distribution in the R branch of the band 4278 of the negative nitrogen group, the temperature in the auroral region was found to be −33°C. (*Same item as* 5C–62, March 1954, *Met. Abs.*) *Subject Headings:* **1. Auroral zone temperatures 2. Auroral nitrogen bands.**—*M.L.R.*

1935

12E–3 551.594.51:551.524.7

*Vegard, Lars and Tønsberg, Einar, **Continued investigations on the temperature of the upper atmosphere by means of bands appearing in the auroral spectrum.** *Geofysiske Publikasjoner,* Oslo, 11(2), **1935.** 14 p. 5 figs., 6 tables, 6 refs., 8 eqs. **DLC**—Four spectra of band 4278, obtained from Feb. 1933 to the end of March 1934, were used in the study. Method of determining the temperature was described. Average auroral band temperature of the excited molecules derived from the four spectrograms was 225.4°K or −47.6°C. (*Same item as* 5C–79, March 1954, *Met. Abs.*) *Subject Headings:* **1. Auroral spectra 2. Upper air temperatures.**—*M.L.R.*

1937

12E–4 551.594.52:551.54

*Egedal, J., **La haute atmosphère et les aurores.** [The high atmosphere and auroras.] *L. Météorologie*, 3rd Ser., p. 301–303, July/Aug. **1937.** table. **DWB**—A table is presented which give the mean height of auroras of several types (Norway, 1913–14) according to the number of hour after sunset ($2\frac{1}{4}$-$2\frac{1}{2}$, $2\frac{1}{2}$ $3\frac{1}{2}$, $3\frac{1}{2}$-$4\frac{1}{2}$, etc.), in order to see if there is any raising or lowering of the heigh which would correspond to a raising or lowering of pressure in the upper atmosphere (assuming tha rays of equal intensity penetrate to an equal pressure surface) as the sun's influence in the temperatur of the upper air decreases. It was found that for rays the mean height decreases from 165 km to 9 km from 3 hours after sunset to 3 hours before sunrise. (*Same item as* 4J–110, Oct. 1953, *Met. Abs.*) *Subject Headings:* **1. Auroral height frequencies 2. Upper air pressure.**—*M.R.*

1938

12E–5 551.594.51:551.524.

Vegard, Lars and Tønsberg, Einar, **The temperature of the auroral region determined from band spectra.** *Geofysiske Publikasjoner*, Oslo, 12(3), **1938.** 9+p. 4 figs., 4 tables, 2 plates, 9 refs. 7 eqs. **DLC**—Report of "results of temperature measurements within the auroral region by mean of the energy distribution within the negative nitrogen bands appearing in the auroral spectrum based on two spectrograms obtained during the winter of 1935–1936 (exposure lasted from Oct. 1 to March 28) and that of 1936–1937 (exposure from Dec. 3 to April 10). Procedures are summarized From the two spectrograms the mean temperature of the auroral region 95 to 125 km was determine as −35.5°C. These spectrograms and those of 1923–1924 and 1933–1934 gave a mean temperatur of −38.7°C. The spectrograms are reproduced. (*Same item as* 5C–95, March 1954, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. Auroral spectra.**—*M.L.R.*

12E–6 551.594.51:551.510.53

†*Vegard, Lars, **Vorgänge und Zustände in der Nordlichtregion.** [Processes and conditions in th auroral region.] *Geofysiske Publikasjoner*, Oslo, 12(5), **1938.** 23+p. 4 figs., 4 tables, 2 plates 34 refs., 5 eqs. **DLC**—A fundamental monograph giving the solution, or attempted solution, to large number of problems concerning the physical properties of the aurora and the chemistry an physics of the ionosphere, from evidence gained through analysis of numerous auroral spectrogram in connection with magnetic, sunspot and radio propagation data. A few of the main points treate are: 1) the explanation of the types of the red (relative to green) bands (colors) at the lower and uppe portions of rays, 2) the temperature (and density) distribution at 25–150 km and 3) the intensit distribution and changes therein (relative and absolute). Over 100 spectral bands were obtaine by the author and his colleagues, and over 80 of these identified. New bands recently discovere are listed and discussed. (*Same item as* 5C–93, March 1954, *Met. Abs.*) *Subject Headings:* **1. Aurora physics 3. Ionospheric density 4. Ionospheric temperatures.**—*M.R.*

12E–7 551.510.53

†Zenneck, J., **Physik der höhen Atmosphäre.** [Physics of the upper atmosphere.] *Ergebniss der Kosmischen Physik*, Leipzig, 3:1–37, **1938.** 21 figs., 28 refs. **DLC**—A scholarly and highl technical summary of all current knowledge of the ionosphere and methods of investigation of th ionospheric layers. In Pt. I, the physics of the ionosphere and physico-chemical processes ar discussed; in Pt. II, normal ionization and in Pt. III, abnormal ionization are treated in detail and quantitative relationships shown in graphs and tables. Variations in ionization with height and time (diurnal and seasonal), solar eruptions, winds and sudden changes are considered. In Pt. IV the origin of ionization (Dellinger effect) and knowledge of pressure, temperature, atmospheri composition and horizontal and vertical air motion, electrical state in stratosphere gained through radio-propagation studies and meteor phenomena are also treated. The bibliography, though no extensive, is useful. (*Same item as* 6D-14, April 1955, *Met. Abs.*) *Subject Headings:* **1. Ionospheri physics 2. Progress in ionospheric research.**—*M.R.*

1941

12E–8 551.594.5:551.557:551.524.7(481

Penndorf, R., **Die Wintertemperaturen der Nordlichter über Tromsø.** [The winter tem peratures of auroras over Tromsø.] *Meteorologische Zeitschrift*, 58(12):429–433, Dec. **1941.** fig. table, 14 refs., 4 eqs. **DWB**—Summarizing the limited available observations on the temperature of the auroras from Oct. to April 1923–1939 made at Tromsø, the author could not find a significan variation from month to month. The mean temperature of about −45°C corresponds to the true gas temperature. The change in lower height limits of auroras from the dark atmosphere to an atmosphere illuminated from the sun is due to different conditions of excitation, rather than to

thermal expansion of the air. A mean west wind of 100 m/sec^{-1} at 60°N. is derived. (*Same item as* 4J–150, Oct. 1953, *Met. Abs.*) *Subject Headings:* **1. Auroral temperatures 2. Ionospheric winds 3. Tromsø, Norway.**—*A.A.*

1945–1949

12E–9 551.524.7:541.124.7:546.211

Gauzit, Junior, **La température de l'atmosphère supérieure et la dissociation photochimique de molécules d'oxygène.** [Temperature of the upper atmosphere and photochemical dissociation of molecular oxygen.] *Annales de Géophysique*, 1(3):233–243, Dec. **1945.** fig., 15 eqs. **DLC**—Temperature in the upper atmosphere at 100 km altitude is calculated on the basis of collisional frequencies following the formation of high velocity atoms by photochemical dissociation of oxygen. (*Same item as* 6E–40, May 1955, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. Oxygen dissociation 3. Collisional frequencies.**—*G.T.*

12E–10 551.513:551.557

Hoffmeister, C., **Die Strömungen der Atmosphäre in 120 km Höhe.** [Atmospheric currents at a height of 120 km.] *Zeitschrift für Meteorologie*, 1(2/3):33–41, Nov./Dec. **1946.** 8 figs., 2 tables, 5 refs. **DWB**—Observations of meteor trails were partly visual, partly photographic. Height determinations from pairs of photographs showed optimum density for trails to be about 120 km and this height was assumed throughout. Results of observations of velocity and direction shown graphically. There is ample photographic evidence of strong turbulence at this level. (*Same item as* 4F–32, June 1953, *Met. Abd.*). *Subject Headings:* **1. Meteor trails 2. Upper air winds.**—*G. J. Evans.*

12E–11 551.524.7:541.124.7

Seaton, S. L., **Temperature and recombination coefficient in the ionosphere.** *Journal of Meteorology*, Boston, 4(6):197–200, Dec. **1947.** 8 figs., refs., 6 eqs. **DLC**—Methods are developed for evaluating from experimental data the recombination coefficient between electrons and positive ions throughout the 24 hours in the ionosphere. Values of the recombination coefficient so determined are applied to calculation of ionospheric temperature from Thomson's relationship. Adoption of suitable reference temperature and corresponding recombination coefficients is discussed. Composite atmospheric temperatures at noon are given for equinoctial period at the equator during sunspot minimum. Highest temperatures, of the order of 600 K, are found at the height of 100 km. Noon temperatures in the region 200–400 km appear to be of the order of 200 K to 250 K. (*Same item as* 6E–52, May 1955, *Met. Abs.*) *Subject Headings:* **1. Recombination coefficient 2. Upper air temperatures.**—*Author's abstract.*

12E–12 551.510.535

†Al'pert, Ia. L., **Sovremennoe sostoianie voprosa ob issledovaniiakh ionosfery.** [Present status of the problem on investigation of the ionosphere.] *Uspekhi Fizicheskikh Nauk*, Moscow, 36(1):1–29, Sept. **1948.** 5 figs., 6 tables, 51 refs., 6 eqs. **DLC**—A long review of theoretical basis for our present (1948) knowledge of the nature and formation of the ionosphere. A great deal of data and theory from recent literature from all parts of the world is organized along the following lines: 1) Formation of ionospheric layers; 2) Basic processes in ionosphere (photoionization, recombination of electrons, recombination of ions, dissociation of electrons from ions); 3) Theory of recombination and its weaknesses; 4) Problems of the F2 layer and difficulties with the theory of photoabsorption of ultraviolet in F2 layer; 5) Effective impact index γ effective for various layers of the ionosphere; 6) Temperature, density and structure of the ionosphere. Models, tabular data and many references are given besides the theory. (*Same item as* 4.10–98, Oct. 1953, *Met. Abs.*) *Subject Headings:* **1. Ionospheric research 2. Ionospheric structure.**—*M.R.*

12E–13 551.510.3:551.593.55

Link, F., **Densités de la haute atmosphère d'après les brillances crépusculaires au zénith.** [Densities of the upper atmosphere from crepuscular brilliances at the zenith.] *International Council of Scientific Unions, Brussels, Sixth Report of the Commission for the Study of Solar and Terrestrial Relationships*, Orléans, France, **1948.** p. 169–170. **DWB**—Calculates the following table:

h, km	50	60	70	80	90	100	120	140	160	180
-log	3.04	3.60	4.17	4.54	4.80	5.04	5.51	5.95	6.36	6.71

Values are relative, including an unknown constant of integration. (*Same item as* 2.7–54, July 1951, *Met. Abs.*). *Subject Headings:* **1. Atmospheric density 2. Twilight.**—*C.E.P.B.*

12E–14 551.510.535:551.594.51:551.521.3

Vegard, L. (*Oslo Univ., Norway*), **Report on recent work on ionospheric phenomena and on sol and terrestrial relationship.** (In: International Conference on the Emission Spectra of the Nig Sky and Aurorae, London, 1947, **Papers,** pub. **1948.** p. 82–91. 3 refs.) **DWB**—A summary many separate investigations reported in papers by the author published since 1940 in *Geofysis Publikasjoner,* Oslo. The problems discussed are: (1) Detection and interpretation of new lines auroral spectrum; (2) wave length and relative intensity of the weak component of the red O(doublet; (3) variability of intensity distribution within the auroral spectrum; (4) determination ionospheric temperature from aurorae at different altitudes and in sunlight; (5) origin and excitatio of sodium line in twilight; (6) coronal phenomena and their relation to solar and terrestrial processes (7) probability of an O atom losing its excitation energy through collisions. It is suggested that t sodium enters the atmosphere from the sun. (*Same item as* 3.9–89, and 5C–130, *Met. Abs.*) *Subje Headings:* **1. Auroral physics research 2. Light of the night sky 3. Auroral spectra 4. Ionosphe temperatures 5. Coronal phenomena 6. Earth's corona. I. Kvifte, G. II. Tønsberg, E.**—*M.K.*

12E–15 551.596.1:551.524

†Cox, E. F.; Atanasoff, J. V.; Snavely, B. L. et al., **Upper-atmosphere temperatures from Helg land Big Bang.** *Journal of Meteorology,* Boston, 6(5):300–311, Oct. **1949.** 15 figs., 6 tables, 55 refs. 5 eqs. Abstract p. 300. **DWB**—An interesting analysis of acoustical and microbarometric da obtained at a series of stations extending for 1000 km south from Helgoland, where a giant bla occurred on April 18, 1947. Normal audibility occurred up to 120 km, and abnormal audibili from 200 to 250 or perhaps 500 km to the south of the blast. From all available upper air soundin of temperature and wind, and from other data collected, the authors attempt to calculate all possi paths of abnormal sound or pressure waves, and to deduce the temperature profile up to 170 k height. An excellent bibliography is appended giving an exhaustive list of references on anomalo propagation of sound in the atmosphere. (*Same item as* 2–182, Feb. 1950, *Met. Abs.*) *Subje Headings:* **1. Audibility zones 2. Upper air temperatures 3. Acoustical phenomena. I. Beeche D. W. II. Brown, J.**

12E–16 551.510.5

†Gerson, N. C., **Nocturnal ionization in the F2 ionospheric region.** *Reviews of Modern Physic* 21(4):606–624, Oct. **1949.** 5 graphs, table, 137 refs., 54 eqs. **DLC**—Author explains nocturn ionization by electron recombination processes. He first summarizes data on atmospheric compos tion and structure (complete mixing up to 350 km) and variation of temperature and pressure wi height by day and night. Rates of insolation, photo-ionization and photo-dissociation in ionosphe are determined, and possible non-solar bombardment, horizontal and vertical transport of ions, a especially storage of ions may prove effective. Rate of recombination is examined quantitative assuming a marked fall of temperature at night at 300 km; predicted and observed electron densiti agree passably. (*Same item as* 4.10–105, Oct. 1953, *Met. Abs.*) *Subject Headings:* **1. Ionospher research 2. F2 layer.**—*C.E.P.B.*

12E–17 551.510.53

Nicolet, M. and Bossy, L., **Sur l'absorption des ondes courtes dans l'ionosphère.** [On t absorption of short waves in the ionosphere.] *Annales de Géophysique,* 5(4):275–292, Oct.-De **1949.** 4 figs., 2 tables, 19 refs., 55 eqs. **DWB**—A theoretical study of the structure of the ionosphe in the E and D layers, including the probable temperatures, absorption and ionization in suc variable layers, and variation of absorption of high frequency waves with varying zenith distance the sun. The amount of dissociation of O_2 in the two layers is calculated. (*Same item as* 8-3 Aug. 1950, *Met. Abs.*) *Subject Headings:* **1. Ionospheric structure 2. Atmospheric absorptio** —*M.R.*

12E–18 551.510.53

Sauberer, Franz, **Unsere Kenntnisse über die hohe Atmosphäre.** [Our knowledge of the upp atmosphere.] *Geographische Gesellschaft, Vienna, Mitteilungen,* 91(10–12):225–227, **1949.** re **DLC**—Brief note summarizing recent discoveries regarding the structure and composition of t stratosphere, the ionization of the ozonosphere, and the knowledge gained from V-2 ascents or stud of the aurora. Temperature measurements up to 160 km elevation are presented. (*Same item c* 11–50, Nov. 1950, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere research 2. Ozone laye** —*M.R.*

1950

12E–19 551.510.535(54

†Baral, S. S. and Mitra, A. P., **Ionosphere over Calcutta.** *Journal of Atmospheric and Terrestri Physics,* London, 1(2):95–105, **1950.** 8 figs., 26 refs., 18 eqs. **DWB**—Ionospheric records made a

Calcutta during the period Jan. 1945 to June 1950 are systematically analyzed and the results resented in diagrams to show variations in rate of electron production, temperature of the ionospheric regions, effective coefficient of recombination and the intensity of the earth's magnetic field n the ionosphere. Theoretical developments are presented for each phase of the subject and calculations given for temperatures of E, F1 and F2 layers for summer and winter, respectively (E layer 90°K and 220°K for atomic oxygen, 380°K and 450°K for O_2; F2 layer 700°–1200°K for high and 00°–900°K for low solar activity). (*Same item as* 2.7–62, July 1951, *Met. Abs.*) *Subject Headings:* . **Ionosphere 2. Calcutta, India.**—*M.R.*

12E–20 551.510.53:551.510.41

Bates, D. R., **Basic properties of the upper atmosphere.** *Weather*, 5(12):420–423, Dec. **1950.** ıble, ref. **DWB**—Sets out briefly evidence for chemical composition (ozone, free sodium atoms), mperature and density 0–120 km, and estimates of variations of these above 120 km. (*Same item* 2.5 49, May 1951, *Met. Abs.*) *Subject Headings:* **1. Atmospheric structure 2. Atmospheric mposition.**

12E–21 551.510.53:551.524.7:531.51

Berkes, Zoltán, **A nehézségi erőtér szerepe a hőmérséklet függélyes csökkenésében.** [The le of gravity in the vertical distribution of atmospheric temperature.] *Időjárás*, 54(3–4):80–87, [arch–April **1950.** 2 figs., 7 refs., eqs. French summary p. 129–130. **DLC**—An attempt to xplain theoretically the actual or known vertical distribution of temperature and density in the mosphere up to 130 km. Reference is made to recent theories of ACKERMANN and AUJESZKY. It stated that the stratosphere is a result of the formation at a high level of a layer which is highly sorbent of solar radiation (ozonosphere), without which layer the temperature would continue to op. (*Same item as* 2.8–45, Aug. 1951, *Met. Abs.*) *Subject Headings:* **1. Atmospheric structure Upper air temperatures 3. Gravity effects.**—*M.R.*

12E–22 551.510.535:551.524.7

Burkard, O., **Thermische Aufspaltung ionosphärischer Schichten.** [Thermal separation of nospheric layers.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 2(2–3):308–314, 950. 3 figs., 2 refs., 15 eqs. Summary in German, English and French p. 308–309. **DWB**—An vestigation into the causes of the ionospheric layers, considering vertical temperature, pressure and diation distribution which is known or assumed at present. Mathematical calculations lead to nclusion that splitting is due to thermal considerations, but theory is not in complete harmony th observations. (*Same item as* 7–33, July 1950, *Met. Abs.*) *Subject Headings:* **1. Ionospheric yers 2. Upper air temperatures.**—*M.R.*

12E–23 551.510.535(744)

Gerson, N. C. (*Geophysical Res. Dir., Cambr., Mass.*), **Ionospheric research in the U. S. Air rce.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 7:136–142, c. **1950. DWB**—A brief review of extensive theoretical and experimental studies. Especially portant are rocket flights. Research on artificial auroras and flying ionospheric stations is conlered. A theoretical examination of temperatures in the upper atmosphere is made, but different sults, depending on given model ionosphere, are obtained. A spectrophotometer for further roral research is being constructed. The author emphasizes that Arctic research in North America ould be intensified. (*Same item as* 4.10–104, Oct. 1953, *Met. Abs.*) *Subject Headings:* **1. Ionoheric research 2. U. S. Air Force Research Center, Mass.**—*A.A.*

12E–24 551.510.53:551.510.3:523.5

Link, F., **Exploration météorique de la haute atmosphère.** [Meteoric exploration of the upper nosphere.] *International Union of Geodesy and Geophysics. Association of Terrestrial Magnetism d Electricity, IATME Bulletin*, No. 13:496–499, **1950.** fig., refs., eqs. **DWB**—Calculation of the at gain and loss by meteors entering the atmosphere indicate that in the layer where most meteors visible (from 80 to 110 km) the greatest density gradient (β) $=.72\times10^{-6}$ cm^{-1}. Twilight measurents gave $\beta=.56\times10^{-6}$ cm^{-1}. WHIPPLE'S calculations from meteors gave $\beta=1.4\times10^{-6}$ which is nsidered completely out of the range of possible values and could only occur on the assumption a heat exchange only 0.1 that which would be necessary for complete fusion. Graphs show that height interval of visibility (H_a-H_d) increases on the whole with increasing altitude (50–150 km) dicating that the density gradient β decreases with increasing altitude. (*Same item as* 5.5–76, ay 1954, *Met. Abs.*) *Subject Headings:* **1. Meteoric exploration of atmosphere 2. Density gradient upper atmosphere 3. Upper atmosphere density.**—*M.R.*

12E–25 551.501.83:551.593.55

Link, F., **Sur la possibilité des sondages optiques de la haute atmosphère à l'aide des phénomènes crépusculaires.** [On the possibility of optical soundings in the upper atmosphere by the

aid of crepuscular phenomena.] *International Union of Geodesy and Geophysics. Association Terrestrial Magnetism and Electricity, IATME Bulletin*, No. 13:504–506, **1950.** figs., table, 8 r **DWB**—Objections to optical sounding methods during twilight on the grounds of secondary a higher order scattering errors can be avoided if the work is done with measurements toward infrared (8000 Å). Curves are given for log of brilliance b at different angles up to $U = 12°$ $H = 140$ km and a table giving: log ρ (density) for $h = 50, 60, 70 \ldots 180$ km. (*Same item as* 5.7 July 1954, *Met. Abs.*). *Subject Headings:* **1. Optical soundings 2. Twilight phenomena 3. Zen twilight 4. Upper atmosphere density.**—*M.R.*

12E–26 551.507.362.1:551.506.7(7

†Newell, Homer E., Jr., **A review of upper atmosphere research from rockets.** *American G physical Union, Transactions*, 31(1):25–34, Feb. **1950.** 6 figs., 34 refs. Abstract p. 25. **DWI** Research on the upper atmosphere with the V-2 and Aerobee rockets is reviewed; including progr in control of flight, tracking and recovery of instruments and data, and future research program Naval Research Laboratory working together with the Signal Corps, Air Force and Applied Phy Laboratory. Relation of altitude to pressure and temperature up to 120 km as determined fr flights in New Mexico, shown graphically. Solar spectrum, ozone concentration, cosmic radiati ionospheric and photographic data on cloud formations, are discussed and illustrated. (*Same i as* 4–14, and 111–9, *Met. Abs.*) *Subject Headings:* **1. Rockets 2. Upper atmosphere resear** —*M.R.*

12E–27 551.510.53:551.594

*Petrie, William, **Remarks on the passage of positive ions through the upper atmosphe** Saskatchewan. University. Physics Dept., Contract AF 19(122)-152, Scientific Report N AR-1, [1950?]. 33 p. 25 tables, 17 refs. **DWB**—Calculation of the energies of electrons, proto He^+ ions and Ca^+ ions passing through the upper atmosphere, based on speeds of 800 and 1 km/sec, respectively (corresponding to range of possible speed of particles which produce the auro estimated from time of travel from sun to earth during magnetic storms or solar flares) make apparent that the particles cannot be electrons unless the electrons pick up energy in passing throu the atmosphere. Hence, it is concluded that the particles must be positive ions. Various c siderations of alternative possibilities are discussed quantitatively. Extensive tables are given fo temperature of 4000°K for He, Mg, Si, Ca, Na, K, A, K^+, S spectra. (*Same item as* 5C–160, Ma 1954, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere 2. Auroral spectra 3. Solar emanati 4. Ion mobility.**—*M.R.*

12E–28 551.594

Petrie, William, **Remarks on the excitation of hydrogen and helium in the upper atmosphe** *International Union of Geodesy and Geophysics, Association of Terrestrial Magnetism and Electric IATME Bulletin*, No. 13:466 470, **1950.** fig., table, 10 refs. **DWB**—The author cites evidence prove that electron collisions are the source of excitation of H and He in the atmosphere. Excitat temperatures are worked out for H and He in the auroral zone and a temperature of 4600°K indicat VEGARD found the N_2 temperatures were only 300°K, showing that the auroral zone is not in a st of thermal equilibrium. It is thought that the H and He come from the sun and are not perman constituents of the upper atmosphere, since the lines of the 1st two members of the Balmer se are only rarely encountered in the auroral spectra. (*Same item as* 5C–159, March 1954, *Met. A Subject Headings:* **1. Auroral spectra 2. Auroral hydrogen lines 3. Balmer lines 4. Auroral zo temperatures.**—*M.R.*

12E–29 551.510.5

†*Stranz, Dietrich, **Die D-Schicht.** [The *D* layer.] *Deutscher Wetterdienst in der US-Zo Berichte*, No. 14, **1950.** 31 p. 19 figs., 12 tables, 62 refs., 18 eqs. **DWB**—This is a comprehens analysis and description of the probable photochemical processes producing the *D* layer of the io sphere and of its behavior. The origin of the normal *D* layer is attributed to W-radiation and P–radiation. Increased ionization produced by sudden, intense UV radiation in the hydrog resonance-radiation of the Lyman system and in the metallic continuum of the extreme ultravio range increases the thickness of the *D* layer and displaces its lower boundary downward. Te perature and height of the sun increase the absorption of short wave radiation by day. Irregu variations in the absorption of short wave radiations are produced by disturbances in the chron sphere. Increased density of ions and rise in temperature by day at 90 km produce atmosphe currents causing temporary variations in the earth's magnetic field and an additional component the circulation of the stratosphere. The author sets up these atmospheric models, based up temperature, within which he postulates the operation of photochemical processes, and he establis a *D* layer where density of charge carriers explains the damping of electromagnetic waves and t

Mögel Dellinger effect upon different frequencies. (*Same item as* 10–56, Oct. 1950, *Met. Abs.*) *Subject Headings:* **1. Ionosphere 2. D layer 3. Atmospheric models.**—*I.L.D.*

12E–30 551.594.5:551.510.535

Vegard, L., **Nouveaux résultats importants dans l'étude du spectre des aurores boréales et la physique de l'ionosphère.** [Important new results in the study of the spectrum of the aurora borealis and physics of the ionosphere.] *Annales de Géophysique*, Paris, 6(3):157–163, July–Sept. **1950.** fig., 2 tables, 4 refs. French and English summaries. **DWB.** Also issued with similar title, *International Council of Scientific Unions, Mixed Commission on Ionosphere, 2nd meeting, Brussels, Sept. 1950, Proceedings*, pub. **1951.** p. 79–81.—A new spectrograph with two prisms and with an opening F/1.2 was used to study an aurora that appeared Feb. 23–24, 1950. 54 new atomic lines in the region 3900–6300 Å were observed. The presence of molecular O_2 was demonstrated. A large number of lines were shown to be produced by nitrogen and oxygen atoms in the neutral and ionized state. The rotational components of the R-branch of the band 3914 appeared separated so that a more accurate determination of the auroral temperature, namely −54°C could be made. (*Same item as* 3.11–277, and 5C–169, *Met. Abs.*) *Subject Headings:* **1. Auroral spectra 2. Ionosphere 3. Auroral temperatures.**—*From author's abstract.*

1951

12E–31 551.510.535(798)

*†Alaska. University. Geophysical Institute, **State of the earth's atmosphere in the Arctic.** Contract W28-099-ac-445, Research Reports, Nos. 1–10, 12 (Final Report), Aug. 17, 1948–Nov. 15, **1950**, April 30, **1951.** 11 pieces. graphs, tables, refs. **DWB**—This final report summarizes all of the work done under this contract at College, Alaska, between Feb. 1, 1948 and April 30, 1951 under the direction of S. L. Seaton and W. S. Wilson. Studies were made of: 1) The inadequacy of the theory of formation of the E layer by UV ionization; 2) Winds in the ionosphere; 3) Atmospheric ozone at College, Alaska; 4) Searchlight investigations of stratosphere; 5) Temperature of the upper atmosphere and, finally, 6) Theories of ionization, recombination, diffusion and other properties of the ionosphere. Methods of measurement, development of instruments, records obtained and extensive data tabulations are included and literature reviewed. (*Same item as* 4J–201, Oct. 1953, *Met. Abs.*) *Subject Headings:* **1. Ionospheric research 2. Searchlight soundings 3. Ionospheric winds 4. Ozone 5. Ionization 6. College, Alaska.**—*M.R.*

12E–32 551.524.7:551.510.535

†Bates, Davis R., **The temperature of the upper atmosphere.** *Physical Society of London, Proceedings, Ser. B*, 64:805–821, **1951.** 7 tables, 23 eqs., 51 refs. **DWB**—Assuming that at 110 km temperature is about 300°K and particle concentration $7.4 \times 10^{12}/cm^3$, effects of various temperature gradients up to 200–500 km surmounted by an isothermal region are tabulated and a thermal equilibrium in the F region studied. The estimate, based on radio measurements, of the energy gained from ionizing photons is insufficient to balance loss by conduction and emission, and it is suggested that the estimated gain of energy is too low, heat being also supplied to upper atmosphere by unobservable ionization. This should vary with sunspot cycle, agreeing with a suspected sunspot cycle in variation of level and temperature of ionospheric layers. (*Same item as* 3.3–140, March 1952, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. Ionosphere.**—*C.E.P.B.*

12E–33 551.510.53(04)

Chapman, Sydney, **Some phenomena of the upper atmosphere.** *Physical Society of London, Proceedings, Ser. B*, 64:833–844, **1951.** 3 figs., 18 refs. **DWB.** Shorter version in *Meteorological Magazine*, London, 80(949):194–195, July **1951. DWB**—A rapid survey of the physics and chemistry of the upper atmosphere with suggestions for future investigation. Latest views are summarized on temperature (troposphere, stratosphere, mesosphere, thermosphere), composition (homosphere, heterosphere) and ionization or electron density (neutrosphere, ionosphere). Uncertainties in chemical composition and relations between turbulent mixing, diffusion and photochemical action are discussed. Other notes include atmospheric emission spectra (airglow), entry of solar hydrogen into the atmosphere, nuclear chemistry (influence of cosmic rays), ionospheric variation and auroral and equatorial electrojets. (*Same item as* 3.4–93, April, 1952, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere 2. Physics of the atmosphere 3. Atmospheric composition 4. Ionosphere.** —*C.E.P.B.*

12E–34 551.521.17:551.524.7:551.510.41

Gauzit, Junior, **L'absorption du rayonnement solaire ultraviolet et la température de la haute atmosphère vers 100 km. d'altitude.** [Absorption of ultraviolet solar radiation and the temperature of the upper atmosphere at 100 kilometers height.] *Académie des Sciences, Paris, Comptes Rendus,*

233(18):1048–1049, Oct. 29, **1951. DWB**—An investigation of the formation of atoms of oxyg with high kinetic energy through photochemical dissociation of molecules by R. PENNDORF ser as a base for calculations undertaken by the author in order to determine the amount of avera kinetic energy absorbed, at various levels of altitude, by atoms of oxygen at the moment of th formation. As a result of these calculations the author concludes that a temperature of 800°K tween 90 and 95 km and 3800°K at about 130 km should develop unless it were for a considera loss in heat through radiation, conductivity or convection. (*Same item as* 3.10-155, Oct. 19 *Met. Abs.*) *Subject Headings:* **1. Ultraviolet radiation 2. Atmospheric absorption 3. Upper temperatures.**—*G.T.*

12E–35 551.510.535:551.524.7:0

*†Gerson, N. C., **A critical survey of ionospheric temperatures.** *Physical Society of Londe Reports on Progress in Physics*, 14:316–365, **1951.** 18 figs., 10 tables, 142 refs., 116 eqs. Tran into Russian in *Uspekhi Fizicheskikh Nauk*, Moscow, 47(4):561-624, Aug. **1952.** 18 figs., 10 tabl bibliog. p. 619–624, eqs. **DLC**—A survey of methods of inferring the temperature of the atmosphe using basic ionospheric equations. Probable mean annual temperatures in middle latitudes giv by collisional frequencies; auroral scale heights and electron concentration are tabulated showi an increase from 219–300°K at 100 km to a maximum of around 3450°K at 400 km. It is tentative considered that there are no large diurnal temperature variations. The references referred to in t text are arranged alphabetically. (*Same item as* 3.4–100 and 6B–98, *Met. Abs.*) *Subject Headin* **1. Upper air temperatures 2. Ionosphere 3. Ionosphere temperature bibliographies.**—*C.E.P.B.*

12E–36 551.510.535:551.52

Gerson, Nathanial C. (*Air Force Cambridge Res. Lab., Mass.*), **Ionospheric temperatur** *International Council of Scientific Unions. Mixed Commission on Ionosphere, 2nd meeting, Brusse Sept. 1950, Proceedings*, pub. **1951.** p. 95–99. table, 6 refs., 4 eqs. **DWB**—The theory whi enables calculations of magnitude of collisional frequencies and hence ionospheric lapse rates a temperatures from radio ionospheric data is clearly explained. A temperature increase which yie observed collisional frequencies, was found to be 10°K per km in the region from 100 km to 400 k Resulting temperatures are calculated to be 300, 800, 1300, 1800, 2300, 2800, and 3300°K at 100, 15 200, 250, 300, 350, and 400 km respectively. These values are higher than previous models ha indicated. It is expected that the temperature starts dropping at a height somewhat above 400 k (*Same item as* 5.3–128, March 1954, *Met. Abs.*) *Subject Headings:* **1. Ionospheric temperatur 2. Ionospheric lapse rates 3. Collisional frequencies.**—*M.R.*

12E–37 551.508.822:551.557

Jones, E. E.; Hooper, J. E. and Adler, N. L., **The radar-sonde system for the measurement upper wind and air data.** *Institution of Electrical Engineers, London, Proceedings*, **Pt. 2,** 98(64):46 460, Aug. **1951.** 11 figs., table, 10 refs. **DWB**—It is claimed that this new system of determini upper air wind direction and speed, and of telemetering temperature, pressure and humidity alc to a slant range of 100 miles, is 10 times as accurate as previous instruments. Deficiencies in t older systems in use in Europe and America, the general ideas and details of the new instrume and receiver, and the wind computer are described and illustrated. The equipment has be developed by the Physics Dept. of the Telecommunications Research Establishment of Great Brita Wind as well as other elements are measured from pulses sent out by the radiosonde. All workin parts which would be affected adversely by temperature changes are well insulated. All recordi is automatic. (*Same item as* 3.10 64, Oct. 1952, *Met. Abs.*) *Subject Headings:* **1. Radarsond 2. Upper air wind measurement 3. Radiosondes.**—*M.R.*

12E–38 551.510.535:551.524.7:551.594.

Lepechinsky, D., **Effects of temperature variations of the upper atmosphere on the formatic of ionospheric layers.** *Journal of Atmospheric and Terrestrial Physics*, London, 1(5/6):278–285, 195 2 figs., 6 refs., 6 eqs. **DWB, DLC**—It is shown that seasonal and diurnal behavior of the F2 lay is in accord with CHAPMAN'S ion production theory, when temperature changes are taken into a count. It is assumed that the effect of magnetic storms on this layer are essentially due to a abnormal heating subjected to photoionization. A temperature decrease effects an elevation of t region where ions are produced and a decrease of the rate of ion production. (*Same item as* 4.3–10 March 1953, *Met. Abs.*) *Subject Headings:* **1. F2 layer 2. Upper air temperatures 3. Ion productic theories. I. Chapman, Sydney.**—*A.A.*

12E–39 551.510.41:551.510.535:551.507.362

Michigan University. Dept. of Aeronautical Engineering, **Atmospheric phenomena at hig altitudes.** Contract DA 36-039-sc-125, Progress Report No. 5, Final Report, Sept. 1, 1950 to De **31, 1951.** 43 p. 36 figs., 4 tables, 11 refs. **DWB**—List of a series of reports dealing with activiti

of project to determine pressure, temperature, density and composition of air at 100 km during Aerobee ascents. The report describes methods of obtaining and analyzing samples, shock wave experiments for temperature, a falling sphere experiment for ambient density and temperature. Many photos and graphs show activities and results of project, as well as instrumentation equipment. (*Same item as* 5.6–89 and 11I–16, *Met. Abs.*) *Subject Headings:* **1. Atmospheric composition 2. Aerobee observations 3. Stratospheric structure. I. Jones, L. M.**—*M.R.*

12E–40 551.510.53:551.510.41:546.211

Moses, H. E. (*Columbia Univ.*) and Wu, Ta-You (*Ottawa*), **A self-consistent treatment of the oxygen dissociation region in the upper atmosphere.** *Physical Review*, Ser. 2, 83(1):109–121, July 1, **1951.** 5 figs., refs., 32 eqs. **DLC**—Theory is developed for determining degree of dissociation and recombination of molecular or atomic oxygen, and the temperature at 100–140 km. Calculations are made in detail and results presented graphically. Also pressure from 100 to 140 km is shown graphically for various types of soundings (rocket and radio wave). Appendices show various derivations such as the equations for steady state in the detailed model, time required to reach dissociative steady state, the radiative recombination coefficient, cross sections for three-body recombination collisions, discussions of the work of Penndorf and Rakshit, etc. (*Same item as* 3.11–93, Nov. 1952, *Met. Abs.*) *Subject Headings:* **1. Oxygen dissociation 2. Ozonosphere 3. Upper air computations.**—*M.R.*

12E–41 551.510.535

Seaton, S. L., **The ionosphere.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 334–340. 3 figs., 4 refs., 6 eqs.) **DWB**—A general outline of the structure of the ionosphere as well as the history and methods of investigations are given for meteorologists not familiar with the research work in this field. Despite the fact that GAUSS showed that there should be a region of high electrical conductivity in the upper atmosphere, the direct evidence of this region was obtained, only in 1925. The probable distribution of ionization is shown and the occurrence of the different regions is discussed. Above the F2 region a G-region may be present. The author states that from the meteorological standpoint the ionosphere appears to have immense possibilities, but no sure results have as yet been obtained. The ionospheric temperatures are not known sufficiently, but it is probable that the temperature variations are very great. (*Same item as* 3.11–7, Nov. 1952, *Met. Abs.*) *Subject Heading:* **1. Ionospheric structure.**—*A.A.*

12E–42 551.508.9:551.594.51

Vegard, Lars and Kvifte, G., **An auroral spectrogram and the results derived from it.** *Geofysiske Publikasjoner*, Oslo, 18(3), **1951.** 23 p. 11 figs., 2 tables, 14 refs., 4 eqs. **DWB**—The spectrogram was photographed by a new instrument and 310 new lines were found. Auroral lines from 8858 to 3114 Å are given. The results are compared with previous measurements. The ionospheric temperature determined by means of the N^+_2 band 3914 is found to be −54.1°C. (*Same item as* 3.5–74 and 5C–193, *Met. Abs.*) *Subject Headings:* **1. Auroral spectra 2. Temperature of the ionosphere 3. Spectrographs.**—*A.A.*

12E–43 551.510.53:551.590.25

†Whipple, Fred L., **Meteors as probes of the upper atmosphere.** (In: **Compendium of meteorology.** Boston, American Meteorological Society, **1951.** p. 356–365. 3 figs., table, 95 refs., 7 eqs.) **DWB**—A thorough exposition of every possible aspect of meteor study which could apply to meteorology. The article begins with a history of such study, origin of meteoric bodies, definition of terms and limits of velocity of meteor fall, chemical composition as determined by spectra indicated temperatures, fragmentation in atmosphere or flaring due to crumbling. Visual methods of observing height by triangulation were begun in 1798. Later, LINDEMANN and DOBSON used data to determine temperature, density, high level wind drift and turbulence. Height varies from night to day and lower daytime levels are attended by lower average wind speeds. Photographic studies made since 1893 at Yale and more recently at Harvard are used to develop theories which enable computation of air density

$$\rho_0 = -\frac{2^{\frac{1}{2}} V'_0}{\gamma A \tau_0^{\frac{1}{2}} V^2} \left[\int_{t_0}^{\infty} (I/V^2) dt \right]^{\frac{1}{2}}$$

when mass, rate of mass loss, luminosity, acceleration and drag coefficient are first calculated. Errors arise from assumption that drag coefficient γ is constant with respect to velocity and density. These errors will be greatest at great altitudes where γ is large. Comparison with NACA standard atmosphere shows marked similarity (although both curves are anchored to same base at 50–60 km, and NACA atmosphere derives in part from same data). Residuals show strong seasonal correlation and correlation with surface temperatures but not with fronts, declination of sun or sunspot number.

Advances will come from modern radio meteor observation techniques, although there are limitation even to this method. Increased observational accuracy, laboratory studies on the drag and hea transfer coefficients, and study of the physical and chemical nature of meteorites will also contribut to progress. Difference between two methods of radio observation; the pulse packet and the con tinuous transmission (Doppler) method is explained. (*Same item as* 4.1–15, Jan. 1953, *Met. Abs.* *Subject Headings:* **1. Atmospheric structure 2. Meteor observation 3. Radio observation.**—*M.R.*

1952

12E–44 551.510.3 551.521.16:551.593.5

†Ashburn, Edward V. (*U. S. Naval Ord. Test Station, Inyokern, Calif.*), **The density of the uppe atmosphere and the brightness of the twilight sky.** *Journal of Geophysical Research*, Wash., D. C. 51(1):85–93, March **1952.** 5 figs., 2 tables, 25 refs. **DWB**—The intensity of the zenith skyligh was measured for solar zenith angle of 90° to 106° for wavelength of 0.75μ, 0.52μ and 0.44μ. Th polarization was measured for the 0.44μ region. The difference between the measured polarizatio and the computed polarization of the primary scattered light was used to determine the fraction o the total zenith skylight that was due to primary scattering. The equation relating the atmospheri molecular density to the intensity of the primary scattered zenith skylight contains an extinctio term. It was shown that the extinction term can be evaluated most accurately for the blue light The computed atmospheric molecular densities agree with those by the NACA tentative standar atmosphere. (*Same item as* 4.1–77, Jan. 1953, *Met. Abs.*) *Subject Headings:* **1. Atmospheric density 2. Twilight sky brightness.**—*Author's abstract.*

12E–45 551.510.535:551.524.

Burkard, Otto, **Die Bildung ionosphärischer Schichten bei beliebiger Temperaturverteilung in der Atmosphäre.** [The formation of ionospheric layers with various temperature distributions i the atmosphere.] *Geofisica Pura e Applicata*, 22(1/2):63–74, Jan./March **1952.** 7 figs., 9 refs German and English summaries p. 63. **DWB**—A review of previous investigations of ionospheri theory and structure is followed by models showing most recent hypothetical temperature distributio with respect to ion production in the two F layers and the intervening high temperature zone. Th F2 layer is, however, always cooler than the F1 layer. The vertical distribution of ion productio from 160–480 km and resulting theoretical temperature profile are shown graphically. (*Same item as* 4.5–85, May 1953, *Met. Abs.*) *Subject Headings:* **1. F layers 2. Ionospheric temperature 3. Ion production.**—*M.R.*

12E–46 551.510.5

Burnight, T. R. (*Naval Res. Lab., Wash., D. C.*), **Physical characteristics of the upper atmos phere.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 11:67–69 **1952. DWB**—Recent observations by rockets reveal that at 160 km pressures were about 10^{-6} m and temperatures between 80 and 160 km about 250°K. Solar spectrum (69–115 km) reache 2000 Å, so that solar radiation for 200, 2000 and 3000 Å approximates 4500°K (or possibly as low a 3800°K) black body. Measurements of X-radiations (10 Å) and solar radiation more than 1350 Å (near 100 km) and O_3 concentration to 70 km have been obtained. (*Same item as* 4.11–87 and 11I–20, *Met. Abs.*) *Subject Headings:* **1. Solar spectrum 2. Rocket observations 3. Upper atmos phere physics.**—*M.R.*

12E–47 551.510.535

Gerson, Nathaniel C., **The terrestrial atmosphere.** *Science Progress*, London, 40:245–254, 1952 7 tables. **DLC**—Short survey almost entirely devoted to structure of layers above 100 km. Iono spheric temperature and winds, aurora and the airglow are briefly discussed. (*Same item as* 4F–96 June 1953, *Met. Abs.*) *Subject Headings:* **1. Ionospheric winds 2. Ionospheric temperatures** —*G.J.E.*

12E–48 551.594.5(02

*†Harang, Leiv (*Norwegian Res. Establishment, Kjeller*), **The aurorae.** New York, John Wiley and Sons, **1951.** 166 p. 152 figs., 32 tables, eqs., bibliog. p. 159–163. *International Astrophysics Series*, v. 1. **DLC, DWB.** Review by W. Petrie, in *American Journal of Physics*, 20(3):187–188 March **1952. DLC**—This is the first comprehensive text on the aurora in the English language since the translation of Fritz's work in 1883. In Ch. 3, Sec. 5 discusses the temperature determinations of the upper atmosphere by means of the nitrogen bands in the auroral spectrum. The evaluation of the temperature from the 4278 and 3914 Å bands is presented in graphs and tables. (For abstract on the entire book *see*, 4.3–7, March 1953, *Met. Abs.*) *Subject Headings:* **1. Auroral textbooks 2. Auroral temperatures.**—*E.K.*

12E–49 551.510.535(789)

*Hulburt, Edward O. (*Naval Res. Lab., Wash., D. C.*), **Physical characteristics of the upper atmosphere of the earth.** (In: U. S. School of Aviation Medicine, Randolph Field, Texas, **Physics and medicine of the upper atmosphere.** Albuquerque, **1952.** p. 35–53. 4 figs., 4 tables, 22 refs.) **DLC**—The physical and chemical properties of the upper atmosphere above 80 km above sea level are reviewed. The topics covered are as follows: pressure, density and temperature from rocket experiments, winds in the upper atmosphere as determined by sounding balloons, smoke shells and meteor trails, the composition of the atmosphere, solar ultraviolet spectrum, and soft X-rays, atmospheric ozone, the light of the night sky, and the atmosphere above 200 km. Tables giving values of pressure, density and temperature up to 219 km, wind velocities deduced from meteor trails and ozone concentration up to 70 km above New Mexico are presented. (*Same item as* 5.1-114, Jan. 1954, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere physics 2. Upper air soundings 3. New Mexico.**—*I.L.D.*

12E–50 551.510.535

Mitra, Sisir Kumar, (**Symposium on**) **the physical characteristics of the upper atmosphere.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers,* No. 12:21–39, **1952.** 2 refs. **DWB**—The discussion dealt with some unsolved problems, such as: 1) the height of the atmosphere where the diffuse separation begins; 2) the temperature in and above the E layer regions; 3) the distribution of atomic nitrogen; 4) origin of the F2 layer; 5) the nature of the ionized regions responsible for the sporadic E and Es; 6) origin of the winds at the E and F layer heights; 7) origin of the sodium in the upper atmosphere; and 8) the correlation between weather and the ionosphere. Although the topics were but briefly discussed, many theoretical considerations and suggestions were given by the contributors. (*Same item as* 4.6–80, June 1953, *Met. Abs.*) *Subject Headings:* **1. Ionospheric physics 2. Upper atmosphere research.**—*W.N.*

12E–51 551.507.362.1:551.510.535

O'Day, Marcus, **Super-altitude weather.** *Air University Quarterly Review,* 5(1):24–37, **1951/1952.** 2 figs. **DLC**—A useful semipopular outline of the results of research and of contemplated research program is given. The scientific activity of the U. S. Air Force in this field is described. The historic background of the use of rockets in atmospheric research is given. Fig. 1 illustrates a fine model of the upper atmosphere. The instrumentation of rockets, the telemetry and data recovery are discussed. One of the most emphasized subjects of this research program has been the ionosphere. Another task was to discover the chemical composition of the upper atmosphere. Further, the study of the sun has been considered as a necessary part of the research work. (*Same item as* 6D–89, April 1955, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere 2. Ionospheric research 3. Rocket measurements 4. U. S. Air Force research on upper atmosphere.**—*E.K.*

12E–52 551.594.51:551.524.7

Petrie, William, **Rotational temperatures of Vegard-Kaplan auroral bands.** *Physical Review,* 86(5):790–791, June 1, **1952.** 3 refs. **DWB**—The mean temperature derived from the positions of branch maxima of five $^1Eg^+ - {}^3E_u + N_2$ bands in the wave length range λλ3400–3800 was found to be 850°K, using photographs of spectra of several intense auroral displays. These results are more in conformity with estimates of particle density at about 200 km than VEGARD'S values of about 350°K derived from N^+_2 band spectra. (*Same item as* 4.5–235 and 5C–216, *Met. Abs.*) *Subject Headings:* **1. Auroral spectra 2. Upper air temperatures.**—*A.A.*

12E–53 551.594.51:551.508.96(481)

*Vegard, Lars and Tønsberg, Einar, **Results from auroral spectrograms obtained at Tromsø during the winter 1950–51.** *Geofysiske Publikasjoner,* Oslo, 18(8), **1952.** 20 p. 4 figs., 3 tables, 28 refs., 3 plates, eqs. **DLC**—Includes an extensive table comparing the wave lengths previously measured with those from more recent spectrograms obtained at the Auroral Observatory at Tromsø in 1950 with an improved spectrograph which has a much higher light power. Discusses the Doppler displacement of auroral hydrogen lines. On spectrograms here reproduced, Hβ appears quite strong and with Doppler effect in one case, and less strong in another. Measurements of ionosphere temperature, based on the negative nitrogen bands 3914(1): and 4278(2), gave −56°C. Spectrograms obtained at Tromsø during the winter of 1950-51 and at Oslo in Feb. 1950 are reproduced. (*Same item as* 4.10–266, Oct. 1953, *Met. Abs.*) *Subject Headings:* **1. Auroral spectra 2. Doppler displacement of auroral hydrogen lines 3. Ionospheric temperature 4. Spectrographs 5. Tromsø, Norway.**—*M.L.R.*

12E–54 551.510.3:551.510.53

Whipple, Fred (*Harvard College, Obs., Cambridge, Mass.*); Jacohia, Luigi and Kopal, Zdeněk (*both, M. I. T.*), **Seasonal variations in the density of the upper atmosphere.** (In: Kuiper, G. P

(*ed.*), **The atmospheres of the earth and planets.** Rev. ed. Chic., Univ. of Chicago Press, **1952.** p. 149–158. 2 tables, figs., refs.) **DWB**—Contains the summary of data on the air densities of the upper atmosphere as obtained so far from Harvard meteor patrol plates, reduced at the Center of Analysis of Massachusetts Institute of Technology, in an investigation sponsored by the Bureau of Ordnance of the U. S. Navy Department. Atmospheric densities have been derived from measured meteor velocities and decelerations and from the masses as obtained by integration of their light intensity curves, agreement with the standard atmospheric profile proposed by the NACA Subcommittee on the Upper Atmosphere is found satisfactory. Significant individual deviations from the mean density-curve show a marked seasonal character. A strong correlation ($r=0.91$) is established between the observed density derivations and the normal ground temperature for the day of observation. Correlation with the actual ground temperature and with the insolation as found to be progressively less pronounced. (For abstract on 1949 ed., *see* 11–91, Nov. 1950, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere densities 2. Density gradient in upper atmosphere.**

12E–55 551.510.53:551.507.362.1:551.590.25

Whipple, Fred L. (*Harvard College Obs., Cambridge, Mass.*), **Results of rocket and meteor research.** *American Meteorological Society, Bulletin,* 33(1):13–25, Jan. **1952.** 5 figs., 3 append. **DWB**—In this review of recent rocket sounding and photographic observation of meteors, unpublished data on pressure, density and temperature in the upper atmosphere, on composition of the upper atmosphere, on radiation (solar constant, solar ultraviolet and solar X-rays), on ionization and magnetic effects and on possible effects of meteors and micro-meteorites are presented and discussed. Data are classified into 3 "weight classes" according to their considered reliability. Pressure, temperature and density curves are constructed up to an altitude of 130 km. (*Same item as* 4.4–88 and 111–29, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere research 2. Rocket soundings 3. Meteor research 4. Upper air data 5. Ionization 6. Magnetic effects.**—*G.T.*

1953

12E–56 551.524.7:551.510.535:551.594.12

†Akasofu, Syunpichi (*Nagasaki Univ.*), **Effects of the variation of the temperature gradient in the upper atmosphere on the formation of the ionospheric layers.** *Tohoku Univ., Science Reports, 5th Ser., Geophysics,* 5(3):123–139, Dec. **1953.** 7 figs., 3 tables, 34 refs., eqs. Also: Kamiyama, Hiroshi (*Tohoku Univ.*), **Remarks . . .** *Ibid.,* p. 140. 3 eqs. **DWB, DLC**—On the assumption that the temperature gradient varies with height in the course of a day, calculations are made about the ion production rate and the electron density. The variation of the ion production rate in the F2 region is almost contrary to that shown by CHAPMAN, whereas in the E or F region, the variation shows CHAPMAN'S mode. The anomalous variation of the maximum electron density in the F2 region on the equator, at equinox, is explained by the changes of the temperature gradient. It is also noted, however, that the total number of electrons in the F2 region is proportional to cos χ. A brief discussion is made to distinguish the solar tide from the solar heating. In his remarks, KAMIYAMA develops equations from which it appears that in order to account for the anomalous variations of electron density of the F2 layer, it is not necessary to assume that temperature increases with height in the E and F regions but is constant in the intermediate region, as was done by S. AKASOFU. A satisfactory explanation for the electron density anomalies can be found by assuming temperature to increase exponentially. (*Same item as* 9.1–215, Jan. 1958, *Met. Abs.*) *Subject Headings:* **1. Ionospheric temperatures 2. Ionospheric electron density.**—*Author's abstract and G.T.*

12E–57 551.521.326:551.524.7:551.594.51

†Armstrong, E. B. (*Queen's Univ. of Belfast*), **The temperature in the atmospheric region emitting the nightglow OI 5577 line and in regions above faint auroral arcs.** *Journal of Atmospheric and Terrestrial Physics,* London, 13(3/4):205–216, Feb. **1959.** 3 figs., table, 35 refs. **DLC**—A number of observations of nightglow and auroral temperatures made with a photoelectric scanning Fabry-Perot interferometer are presented and discussed. The results suggest that the temperature of the region emitting the night glow λ5577 radiation lies within the range 180° to 220°K, with a most likely value of 190°K. Temperatures measured above faint auroral arcs ranged from 310° to 540°K. The published temperatures of the upper atmosphere obtained spectroscopically are surveyed. (*Same item as* 11.5–132, May, 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere temperatures 2. Auroral temperatures 3. Night airglow tmperatures.**—*Author's abstract.*

12E–58 551.510.3:551.510.53:523.5

Ceplecha, Zd., **Meteor photographs, Pt. 1, Air densities.** *Bulletin of the Astronomical Institutes of Czechoslovakia,* Prague, 4(3):55–60, **1953.** 4 figs., 3 tables, 4 refs., 2 eqs. Russian summary p. 59–60. **Pt. 2, The photographed breakage of Meteor 131a.** *Ibid.,* 4(5):113–119, **1953.** 4 figs., 2 tables, 4 refs., 6 eqs. Russian summary p. 118–119. Also: Link, F., **Sondages météoriques de la haute**

atmosphère. [Meteoric soundings of the upper atmosphere.] *Ibid.*, 4(6):168–170, **1953.** 2 figs., 3 refs., 7 eqs. Russian summary p. 170. **DLC.** Also: Link, F., **Scale height in the ionosphere deduced from meteors.** (In: Kaiser, T. R. (*ed.*), **Meteors.** London, Pergamon Press, 1955. p. 78. 2 refs.) **DWB**—Paper 1: From 14 double photographs taken in 1951, velocities, decelerations, sizes and heights of meteors are determined. From these data the author calculates (according to a mathematical method of analysis developed in this paper) atmospheric densities between 60 and 100 km. Results of the calculation are tabulated and graphically presented. Pt. 2 of the paper contains calculations in connection with various factors involved in the breakage of a meteor, such as geometrical conditions, luminous phenomena, pressure on the front part, etc. An increase of atmospheric density at the height of breakage (around 60 km) is suggested as one possible explanation of the phenomenon. LINK reconsiders the photographic material used by CEPLECHA and derives his own atmospheric density model in agreement with results obtained at Harvard. He also finds that between 80 and 100 km temperature appears to be decreasing with lower latitude. The note on meteors is a discussion of the results of CEPLECHA and LINK. (*Same item as* 8H–27, Aug. 1957, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere density 2. Meteoric exploration of atmosphere 3. Ionospheric height determinations.**—*G.T.*

12E–59 551.510.53(789)

*Kallman, H. K. (*The Rand Corp., Santa Monica, Calif.*), **Physical properties of the atmosphere between ~80 km and ~250 km.** *Journal of Geophysical Research*, Wash., D. C., 58(2):209–217 June **1953.** 2 figs., 2 tables, 10 refs., 19 eqs. **DWB**—Calculated values of temperature, pressure, molecular weight and density are given in tables and on graphs for each 10 km from 80 km to 250 km. The equations applied to the scanty data available at White Sands, N. Mex. are presented in the text. The theory is based on relation between fractional change of concentration with change of height. It is assumed that molecular oxygen dissociates between 80 km and 120 km and molecular nitrogen between 130 and 250 km, and that a lapse rate of −2.5°C/km obtains. Calculated pressure and density at 160 km agree closely with rocket data ($T=390$°K). At 250 km T is given as 615°K, $\rho=2.054\times10^{-14}$, $p=7.405\times10^{-8}$ mb and $M=14.46$ g/ml. (*Same item as* 5.8–92, May 1954, *Met. Abs.*) *Subject Headings:* **1. Physical properties of upper atmosphere 2. White Sands, N. Mex.**—*M.R.*

12E–60 551.507.362.1(789)

†Newell, Homer E., Jr. and Siry, Joseph W., **Rocket upper air research.** *U. S. Naval Research Laboratory, NRL Reprint*, No. 12–53, **1953.** 10 figs., table, 34 refs. Reprinted from *American Rocket Society, New York, Journal*, p. 7–13, Jan./Feb. **1953. DWB**—Review of progress and results of rocket soundings, especially those conducted at White Sands, N. Mex. Various methods of interpreting the available data are discussed. Graphs (reprinted from various papers) showing measured and calculated values of atmospheric pressure, density, temperature, cosmic ray distribution, ozone concentration, electron density, and intensity of the earth's magnetic field are presented for various altitudes (up to 220 km). A wind of 80 m/sec was measured at 200 km. The currently accepted value of 0.131 watt/cm² for the solar constant has been shown by a rocket measurement to be 7% too low. (*Same item as* 5.6–51 and 11I–33, *Met. Abs.*) *Subject Headings:* **1. Rocket research 2. Atmospheric structure 3. White Sands, N. Mex.**—*G.T.*

12E–61 551.594.51

Petrie, W. (*Radio Physics Lab., Defense Res. Board, Ottawa*), **Rotational temperature of auroral nitrogen bands.** *Journal of Atmospheric and Terrestrial Physics*, London, 4(1/2):5–9, **1953.** 4 figs., 11 refs., 11 eqs. **DWB**—Auroral spectrograms of dispersion 42–28 A/mm have been analyzed with a recording microphotometer. Rotational temperatures were determined from the profiles of Vegard-Kaplan and Negative Group nitrogen bands, and found to be in the range 450–750°K. It now appears that spectroscopic, rocket and radio results are in reasonable agreement. (*Same item as* 3–294, March 1956, *Met. Abs.*) *Subject Headings:* **1. Rotational temperatures 2. Auroral zone temperatures 3. Auroral nitrogen bands.**—*Author's abstract.*

12E–62 551.510.535:551.510.62(02)

†Rawer, Karl, **Die Ionosphäre: ihre Bedeutung für Geophysik und Radioverkehr.** [The ionosphere: its importance in geophysics and radio communication.] Groningen, P. Noordhoff, **1953.** 179 p. 67 figs., 143 refs., 68 eqs. **DLC.** Transl. by Ludwig Katz. N. Y., Frederick Ungar, **1957.** 202 p. 72 figs., bibliog. p. 191–198, 68 eqs. **DWB** (M10.535 R257io). Review by E. V. Appleton in *Journal of Atmospheric and Terrestrial Physics*, London, 12(2/3):223, **1958.** Review in *Institution of Electrical Engineers, Journal*, 4(44):463, Aug. **1958.** Review by T. W. Bennington in *Nature*, 182(4643):1116, Oct. 25, **1958.**—A complete text on the use of radio in ionospheric research. Ch. I takes up methods of observation by echoes, spectroscopic methods for aurora and airglow, magnetic, meteor and luminous night clouds, and soundings; Ch. II gives results of observations by

echo methods, magnetic data, composition, pressure, density and temperature. Ch. III discuss theories of ionospheric stratification (origin and disappearance of ionization and explanation different layers. Ch. IV takes up normal and irregular changes of the ionosphere (D, E, F2, F, E G and Es and influence of magnetic storms, eclipses, polar summer and night, commencements Ch. V discusses influence of ionosphere on propagation of radio waves and forecasting propagatio (*Same item as* 6D-297 and 11B-118, *Met. Abs.*) *Subject Headings:* **1. Ionosphere textbooks 2. Ion spheric propagation.**—*M.R.*

12E-63 551.510.53

†Rawer, Karl and Argence, E., **Considérations critiques relatives à la formation de la région de l'ionosphère.** [Critical considerations on the formation of the ionospheric E region.] *Annal de Géophysique*, Paris, 9(1):1-25, Jan./March **1953.** 14 figs., table, 44 refs., eqs. **DWB**—A goo source of information regarding the general theory of formation of ionized regions and experiment results for the height of the E layer. The formation of this layer can be explained by photo-ionizatio of O_2, if this constituent is dissociated at an altitude of about 130 km. X-rays of solar origin produ also some ionization, but an analysis of coronal emission resulted in a too high ionization betwee 95 and 110 km. Graphical information is given on the molecular and electron density as a functio of altitude, on the vertical distribution of temperature, depending above 100 km on different a sumption regarding the dissociation of oxygen alone, oxygen and nitrogen, or no dissociation at a (*Same item as* 6E-143, May 1955, *Met. Abs.*) *Subject Headings:* **1. E layer origin 2. Upper a mosphere 3. Molecular density 4. Electron density.**—*A.A.*

12E-64 551.510.53:551.547:551.51

Yerg, Donald G., **Applicability of continuous fluid theory in the higher atmosphere.** Pen sylvania. State College. Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientif Report, No. 49, Sept. 10, **1953.** 31 p. 2 tables, 5 refs., eqs. **DWB**—The use of the equation motion and the equation of state in the higher atmosphere implies a macroscopic viewpoint a assumes that the atmosphere may be treated as a continuous medium. Numerical criteria for t applicability of the concept of a continuous medium are established in terms of the gradients density, temperature, or pressure and the requirements for a statistical distribution of molecul within an elemental volume. It is found that the atmosphere may be treated as a continuo medium to heights above the F region, if the equations of motion are modified to include high pressure derivatives. Careful consideration must be given to the definition of pressure, temperatur and density. The use of a second order pressure term in the hydrostatic equation indicates that t pressure decreases less rapidly with height than in conventional equations. The modifications of t viscous stress appear as a special case of the general continuous medium problem. (*Same item* 6.4-122, April 1955, *Met. Abs.*) *Subject Headings:* **1. Physics of the atmosphere 2. Upper a pressure.**—*Author's abstract.*

1954

12E-65 551.547:523.51:621.396.8(42

Evans, S., **Scale heights and pressures in the upper atmosphere from radio-echo observatio of meteors.** *Royal Astronomical Society, Monthly Notices*, 114(1):63-73, **1954.** 5 figs., 4 table 12 refs., 13 eqs. **DWB**—The method developed by Kaiser (*item* 12E-66) was applied to a numb of meteor showers at Jodrell Bank. Pressure p at characteristic height H is given by:

$$\log_{10} p = 11.42 + \tfrac{1}{8} \log_{10} H - 2 \log v.$$

Log p (dynes·cm^{-2}) calculated by this equation is plotted against height, increasing from -0 at 99 km to $+0.65$ at 88 km. Atmospheric densities calculated for the same range exceed tho given by rocket data at New Mexico but the difference is only of the order of the standard deviatio They are considerably less than those given by photographic meteor observations over Massachusett (*Same item as* 6.6-239, June 1955, *Met. Abs.*) *Subject Headings:* **1. Radio echoes from meteo 2. Upper air pressure 3. Jodrell Bank, Eng.**—*C.E.P.B.*

12E-66 551.547-523.51:621.396

Kaiser, T. R., **Theory of the meteor height distribution obtained from radio-echo observation Pt. 1-2.** *Royal Astronomical Society, Monthly Notices*, 114(1):39-62, **1954.** 12 figs., 15 refs., 61 eq **DWB**—The radio-echo height distribution for a homogeneous meteor stream is shown to be a functio only of the atmospheric scale height and the mass distribution of the meteors. The results enab the observed dependence of the mean height on the velocity to be interpreted in terms of the variatio of atmospheric pressure with height. For results see: Evans, S. (*item* 12E-65). (*Same item* 6.6-238, June 1955, *Met. Abs.*) *Subject Headings:* **1. Radio echoes from meteors 2. Upper a pressure.**—*C.E.P.B.*

12E–67 511.510.535:551.507.362.1

LaGow, Herman E. (*Naval Res. Lab., Wash., D. C.*), **Physical properties of the atmosphere up nto the F-layer.** (In: Boyd, R. L. F.; Seaton, M. J. and Massey, Harrie, S. W. (*eds.*), **Rocket xploration of upper atmosphere.** London, Pergamon, **1954.** p. 73–81. 5 figs., 13 refs.) **DLC, DWB**—Immediately following World War II some of the V-2 rockets were used for atmospheric esearch investigations. These earlier methods and instrumentation are described. The results btained on the nine rockets that were fired from Oct. 1946 to May 1950 are discussed in this report.)n Aug. 7, 1951 at 219 km peak altitude density of $1.0 \pm 0.2 \times 10^{-7}$ gm/m³ was obtained. Wind was letected at 200 km. Other details on physical properties of the atmosphere such as temperatures, ressures and densities are reported in detail. (*Same item as* 11I–38, Sept. 1960, *Met. Abs.*) *Subject Teadings:* **1. Upper atmosphere densities 2. Rocket observations 3. V-2 rockets.**—*E.K.*

12E–68 551.510.535

Lejay, Pierre, **Méthodes modernes de recherches sur la haute atmosphère.** [Modern methods f research on the upper atmosphere.] Conference at the Palais de la Découverte, Jan. 16, 1954. Paris, **1954.** 25 p. 5 figs. (*Conférences du Palais de la Découverte, Ser. A*, No. 192.) **DLC**—pectroscopic rocket (direct measurement) and radio echo methods of upper atmospheric research re described, and results in terms of temperature (to 150 km), density, winds, ionization, chemical omposition, oscillations and radio propagation conditions discussed in this pamphlet. (*Same item as* 11I–45, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere research 2. Ionospheric oundings.**—*M.R.*

12E–69 551.510.3:551.510.535

Link, F. (*Astrophys. Obs., Ondrejov*), **Variations temporaires et locales de la densité dans la aute atmosphère.** [Temporal and spatial variations of upper atmospheric density.] *Bulletin f the Astronomical Institutes of Czechoslovakia*, Prague, 5(1):1–3, **1954.** tables, 9 refs. Russian ummary p. 3. **DLC**—There are three methods available at present for investigating atmospheric ensity variations in the ionosphere: 1) rocket sounding, 2) meteor observation and 3) twilight sky neasurement. With the first method only qualitative results have been obtained according to ublished reports. Results obtained so far with the other two methods (meteors and twilight sky rightness) are reviewed and compared in this paper. There appears to be a chance of agreement etween diurnal and latitudinal variation of ionospheric density as obtained by the two methods. lore extensive twilight sky brightness measurements will be necessary in order to obtain data on easonal variations by this method. (*Same item as* 8.1–176, Jan. 1957, *Met. Abs.*) *Subject Heading:* **Ionospheric density variations.**—*G.T.*

12E–70 551.507.362.1:551.510.53

Massey, H. S. W., **The nature of the upper atmosphere.** *Endeavour*, London, 13(50):81–85, pril **1954.** 4 figs., 6 refs. **DLC**—General but semitechnical treatment of structure and composition f the high atmosphere, the ionosphere, aurora and airglow according to latest results of rocket and dio research. (*Same item as* 6.4–117, April 1955, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere structure 2. Auroras 3. Rocket observations.**—*M.R.*

12E–71 551.507.362.1:551.510.53

Newell, Homer E., Jr., **Rockets and the upper atmosphere.** *Scientific Monthly*, 78(1):30–36, un. **1954.** 9 figs., 17 refs. **DWB**—A semitechnical résumé of the recent discoveries in upper mosphere physics made by using various types of rockets as instrument carriers. The ozone bsorption of UV light and resulting knowledge of solar emission in various spectral regions, data on nsity, temperature, ozone concentration, electron and ion concentrations, solar X-rays, winds and smic rays and other physical properties of the high atmosphere are discussed and curves presented show quantitative relations based on latest rocket results. Detailed spectrograms of the sun in ort wave lengths above the absorption layer, chemical constitution of the upper atmosphere, ights of luminous emitting layers, and standard data at higher levels than heretofore obtained are lds for future effort. (*Same item as* 6.1–9, and 11I–46, *Met. Abs.*) *Subject Headings:* **1. Rocket search 2. Upper atmosphere physics.**—*M.R.*

12E–72 551.510.535:551.524.67:551.521.6:551.594.6

Pawsey, J. L.; McCready, L. L. and Gardner, F. F., **Ionospheric thermal radiation at radio equencies. Pt. 1.** *Journal of Atmospheric and Terrestrial Physics*, 1(5/6):261–277, **1951.** 9 figs., tables, 6 refs. Also: Gardner, F. F., . . . **Pt. 2. Further observations.** *Ibid.*, 5(5/6):298–315, **54.** 11 figs., 2 tables, 10 refs., eq. **DWB**—Pt. 1—Minimizing man-made radio noises and at-ospherics, the thermal radiation from the ionosphere has been identified and measured. The ectron temperature at 70–80 km was found 240–290°K. Pt. 2—Radio noise on 2 Mc/s at Urisiono 0°S 144°E) a very quiet site in Australia, is attributed almost entirely to ionospheric thermal

radiation. Temperatures (200–250°K) show no diurnal variation but vary greatly from day to d especially in summer, and increase by up to 40°K on SID days. Polarization measurements Sept. 1951 showed that the extraordinary component was absorbed at a lower level 20°K warm than ordinary component, indicating that temperature decreases with height. Measurements temperature-height model given by rockets but about 40°K warmer, giving minimum of 217° at 80 km. Some observations of noise of tropospheric origin are described. (For Pt. 1, *see* 4.6–8 for Pt. 2, 6D 243, *Met. Abs.*) *Subject Headings:* **1. Ionospheric radiation 2. Ionospheric ter perature 3. Urisiono, Australia.**—*A.A. and C.E.P.B.*

12E–73 551.594.53:535.33:551.521.17(712.

Petrie, W. and Small, R. (*Univ. of Saskatchewan*), **The intensities of ultraviolet features of t auroral spectrum.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers,* N 30:61–73, July **1954.** fig., 5 tables, 15 refs., 4 eqs. Discussion p. 69–72. **DLC**—Twenty-eig ultraviolet spectra of the aurora have been secured at Saskatoon, using a single-prism quartz spectr graph. Fifteen of these plates have been analyzed with a microphotometer and intensitometer a integrated relative intensities have been obtained of the main spectral features. The intensiti have been corrected for the effects of Rayleigh scattering and ozone absorption. The correct intensities are carefully discussed and it is shown that they yield vibrational temperatures less th 500°K. This temperature value is different from earlier results and additional measurements a desirable. (For shorter version *see item* 4.2–289, Feb. 1953, *Met. Abs.*) (*Same item as* 6.9–334 a 12A–191, *Met. Abs.*) *Subject Headings:* **1. Auroral spectra 2. Ultraviolet intensities 3. Ozo absorption 4. Saskatoon, Saskatchewan.**—*Authors' abstract.*

12E–74 525.6:551.510.535:551.594.12 551.524.73:551.510.535:551.594.

Shimazaki, Tatsuo (*Radio Research Laboratories, Tokyo*), **Effect of the solar tides and t temperature change in the daily variation in electron density and height of the F2 layer.** *Journal Geomagnetism and Geoelectricity,* Kyoto, Japan, 6(2):68–82, June **1954.** 7 figs., 12 refs., eqs. **DL** Also reprinted as *Japan. Radio Research Laboratories, Tokyo, Journal,* 2(8):following p. 21 April **1955. DWB**—Chapman's ion-production function in an isothermal ionosphere is first modifi for the convenience of applying it to the ionosphere with the temporal variation of temperatu Using this ionization function, the equation of motion and the equation of continuity are solve taking both the thermal and tidal variations into account. As a result, the maximum electr density and its corresponding height can be obtained for each hour during a day. Departures these from the norm of the static Chapman region indicate that the behavior of the departure Δ is very different from that by WEISS, who deals only with tidal effect on the ionosphere. In o case it is inversely proportional to the temperature variation in the course of a day except in t morning when the electron density is very small. It is also noted that the semidiurnal variation Δn_m appears even in the case of taking into account only the *diurnal* variation in temperature b not the tidal variation. As regards the behavior of Δh_m, the result similar to WEISS' can be see but with the reasonable difference that it is much raised and lowered by thermal expansion a contraction in the afternoon (high temperature) and in the morning (lower temperature), respectivel Further, the effect of temperature variation and tidal one exerted simultaneously on the daily vari tions in the maximum electron density and its height seem to show the complicated mutual inte action between these two effects. (*Same item as* 11F–132, June 1960, *Met. Abs.*) *Subject Heading* **1. Electron density in F2 region 2. Solar tides 3. Temperature variations 4. F2 layer heig variations.**—*Author's abstract.*

12E–75 551.510.53:551.507.362

Spencer, N. W. and Dow, W. G. (*both, Dept. of Elec. Eng., Michigan Univ., Ann Arbor*), **Densit gauge methods for measuring upper-air temperature, pressure, and winds.** (In: Boyd, R. L. F Seaton, M. J. and Massey, Harrie, S. W. (*eds.*), **Rocket exploration of upper atmosphere.** Londo Pergamon, **1954.** p. 82–97. 14 figs., 9 refs.) **DLC, DWB**—Rocket instrumentation methods usi air density gages for determination of upper air temperature, pressure and density are describe Tentative results are given of direct temperature determinations using alphatron gages and co aerodynamics for Aerobee rockets, 1949 to 1952; temperatures derived from V-2 rocket pressu measurements using thermionic ionization gages (1946-1949) are presented. Ionization ga evidence is shown of the existence during one V-2 flight of a horizontal wind stratum, and method is described for using cone aerodynamics to determine winds. A d.c. and a v.h.f. volta breakdown method for air density determination are described. The engineering design reliabili problem in rocket instrumentation is emphasized; parachute recovery of data and instruments briefly discussed. (*Same item as* 11I–38, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper a temperatures 2. Upper air pressure 3. Upper air winds 4. Upper atmosphere density measur ment techniques 5. V-2 rockets 6. Aerobee rockets.**—*E.K.*

12E–76 551.501.7:551.510.53

Vassy, E., **La haute atmosphère.** [The upper atmosphere.] *La Météorologie*, Paris, 4th Ser., No. 35:185–194, July/Sept. **1954.** 12 figs. **DWB**—Review of different indirect methods for obtaining information on the high atmosphere (radio and sound propagation, meteors, ozone, twilight airglow and auroral data), and direct methods used since the war (rockets) to obtain density, temperature, chemical composition, ozone and mass spectrometer data. Measurement of electrical properties by means of (a) UHF; (b) the U. S. Naval Research Laboratory (NRL) method using two figures, 2.34 Mc and 25.6 Mc, or the sixth harmonic of the first, to determine ionization at 80–160 km; (c) the Langmuir method which determines that no electrons exist below 70 km, although + and − ions occur at 60 km; and (d) Doppler method are described. (*Same item as* 9.9–107 and 11I–52, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere structure 2. Upper atmosphere research 3. Rocket soundings.**—*M.R.*

1955

12E–77 551.507.362.1:551.510.53

Appleton, Sir Edward, **Rocket sounding in the upper air: confirmation of results inferred from radio measurements.** *Wireless World*, London, 61(9):406–407, Sept. **1955.** 4 eqs. **DLC**—In connection with plans for the International Geophysical Year, the article briefly describes methods of measuring pressures and deducing temperatures, and of measuring electron density at a given height by the Doppler effect on the phase velocity of radio waves near the rocket emitter. (*Same item as* 7.3–102 and 11I–55, *Met. Abs.*) *Subject Headings:* **1. Rocket instrumentation 2. Ionospheric electron density measurement 3. Upper air pressure measurements.**—*C.E.P.B.*

12E–78 551.510.535:551.511

Davids, Norman, **The diffusion thermo effect in the atmosphere above 120 km.** Pennsylvania. State Univ., Ionosphere Research Laboratory, Contract AF 19(604)-1304, Scientific Report, No. 76, July 1, **1955.** 25 p. 2 figs., 4 refs., eqs. **DWB**—The diffusion thermo effect, in which a temperature gradient is formed by the action of a heat transport due to a diffusion process, is investigated theoretically in the atmosphere above 120 km. It is shown that the problem can be reduced to a pair of linear partial differential equations of second order in two variables. Suggestions for the solution of these equations are presented. *Subject Headings:* **1. Thermal diffusion 2. Ionosphere.**—*Author's abstract.*

12E–79 551.547:551.501.81:551.590.25

†Evans, S. (*Jodrell Bank Exp. Station, Univ. of Manchester*), **Atmospheric pressures and scale heights from radio echo observations of meteors.** (In: Kaiser, T. R. (*ed.*), **Meteors.** London, Pergamon Press, **1955.** p. 86–91. 7 figs., 21 refs., 6 eqs.) **DWB**—The distribution of heights of meteors observed on radio echo equipment has been shown to depend significantly only on the mass distribution of the incident meteors and the atmospheric scale height. At altitudes of the order of 100 km, values of the scale height are derived from the width of the height distributions and values of atmospheric pressure at the maxima of the distributions are obtained from the meteor evaporation equations. A comparison of these results with those obtained from photographic meteor and rocket observations is felt to be valid since the same parameters are required in the evaporation equations used in photographic and radio meteor theory. The present results are not significantly different from those obtained in New Mexico and geographical variations therefore appear to be small. Seasonal variations in the height of a given pressure level are of the order of ±1 km which is little greater than the probable error. Possible diurnal and semidiurnal variations both having an amplitude of the order of ±1 km have been found. (*Same item as* 8H–57, Aug. 1957, *Met. Abs.*) *Subject Headings:* **1. Upper air pressure 2. Radio echoes from meteors.**—*Author's abstract.*

12E–80 551.501.7:551.510.53

Ghosh, S. N. (*Harvard Univ.*), **Methods for the measurement of upper atmospheric characteristics.** *Journal of Scientific and Industrial Research, Sec. A*, New Delhi, 14(6):277–284, June **1955.** 5 figs., 12 refs., 2 eqs. **DWB**—A review of technical methods, both direct and indirect, for sounding the upper atmosphere. Indirect methods include radio echoes for probing ionosphere, acoustical sounding, searching methods for determining density, meteor and auroral observations and spectroscopic studies of dissociation and recombination. Direct methods include airglow, rocket and balloon measurements and direct determination of temperature, winds and ionization in the ionosphere. Laboratory and theoretical studies of microwave propagation and photo-chemistry are also outlined and illustrated. (*Same item as* 7.7–83, July 1956, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere sounding methods 2. Upper atmosphere physics 3. Ionospheric research.**—*M.R.*

12E–81 551.594.51:551.524.7

Jones, A. Vallance and Harrison, A. W., **Rotational temperatures of the auroral N_2^+ bands.** *Journal of Atmospheric and Terrestrial Physics*, London, 6(6):336–343, June **1955.** 5 figs., table, 10

refs. **DWB**—The basis of temperature computation from auroral spectra is discussed. Five plates of 3914 Å band were obtained with a high-dispersion spectrograph at Saskatoon and temperatures estimated. They ranged from 250–400°K but a considerable contribution from a region as low as 200°K is necessary to give the observed intensities. Some of the plots showed curvature attributed to variation of temperature with height in auroral region. (*Same item as* 6.10 287, Oct. 1955, *Met. Abs.*) *Subject Heading:* **1. Auroral temperatures.**—*C.E.P.B.*

12E–82 551.524.7:551.510.535

Lowan, Arnold N. (*Yeshiva Univ., N. Y. and Naval Res. Lab., Wash., D. C.*), **On cooling of the upper atmosphere after sunset.** *Journal of Geophysical Research*, Wash., D. C., 60(4):421 429 Dec. **1955.** 2 figs., table, 21 eqs. **DLC**—The cooling of the "upper atmosphere" (region between the altitude $h_0 = 100$ km and the altitude $h_1 = 380$ km) after sunset was investigated under the assumptions that (a) the temperature at the altitude h_0 is constant and equals 240°K, (b) the temperature gradient at the altitude h_1 is equal to zero, and (c) the process of heat transfer takes place solely by conduction. Assumed initial temperature is that given by the Rocket Panel, ranging from 240°K at altitude h_0 to 1250°K at altitude h_1. For the sake of simplicity, thermal conductivity K and specific heat c were assumed constant and dependence of density ρ on temperature was ignored. The differential equation of heat conduction being solved numerically on the assumption that the density ρ and, therefore, the thermal diffusivity $\alpha = K/c\rho$ varies with altitude but is independent of time, the variation of ρ with altitude being that given by the Rocket Panel. The computations revealed that after $2\frac{1}{2}$ hrs the temperature has not changed at altitudes below 160 km, and that the maximum drop at altitude h_1 is 440°K. From the computed temperatures at time $t = 2^h$ (2 hrs) the densities were computed from formula (2). Computations revealed that a certain settling of the atmosphere takes place, the densities at time $t = 2^h$ being larger than at time $t = 0$ in some regions and correspondingly lower at altitudes above the upper limit of this region. Analysis of the ion density led to the conclusion that there is an appreciable increase of the ion density in the F layer in spite of the recombination of ions which takes place after sunset. (*Same item as* 8.8–234, Aug. 1957, *Met. Abs.*) *Subject Heading:* **1. Ionospheric temperature computation.**—*Author's abstract.*

12E–83 551.510.535:01

†Manning, Laurence A., **Survey of the literature of the ionosphere.** Stanford Univ. Radio Propagation Laboratory, Contract AF 19(604)-686, Final Report, July 31, **1955.** 650 p. illus. tables, eqs. About 1400 abstracts arranged alphabetically by author. *ASTIA photostat*, No. AD-75 477. "In essence a second edition of the **Survey** of 1947 which was prepared for the Air Materiel Command" (*see* 4F–35, June 1953, *MAB*).—The 1000 abstracts in the 1947 edition have been increased to over 1400, and the annotated bibliography (p. 19–463) is supplemented by lists of journals, subjects and institutions and their code abbreviations, a subject index (p. 464–511), and a summary of knowledge of various aspects of ionospheric physics and propagation (p. 512–650). The subjects discussed are: structure, recombination, disturbances, propagation, methods of investigation, wave paths, height analysis and meteors. The latest abstracts included are 1954, the earliest about 1928. (*Same item as* 8.8–70, Aug. 1957, *Met. Abs.*) *Subject Headings:* **1. Ionospheric bibliographies 2. Ionospheric radio wave propagation.**—*M.R.*

12E–84 551.524.7:551.510.535

†Newell, Homer E., Jr. (*U. S. Naval Research Lab., Wash., D. C.*), **Temperatures in the upper atmosphere.** (In: American Institute of Physics. **Temperature, its measurement and control in science and industry,** Vol. 2 (Oct. 1954 Symposium, pub. **1955.** p. 429–444. 8 figs., 2 tables, 40 refs. **DWB, DLC**—The NACA tentative standard atmosphere, and results of more recent methods of determination of temperatures to 100 or 200 km in the upper atmosphere are discussed, illustrated and curves presented to show values. The anomalous propagation of sound, meteor trail photography or radio echoes from ionized meteor columns, ionospheric scale heights, spectroscopic studies of airglow and aurora, calculations of ozone heating, atmospheric oscillations and escape of He are among the indirect methods, and soundings by means of rockets (pressure on side, on nose cone at nose tip, absorption of UV light in atmosphere, pressure modulation on rolling rocket, transit time of sound waves, trajectory of falling spheres or shock wave angle) and, finally, rocket grenade methods are examples of more or less direct methods where either pressure, temperature or density and eventually temperature can be determined. Diurnal changes are greatest at about 50 km but more about rate of cooling and extreme diurnal changes must be learned before curves can be improved. (*Same item as* 11I–63, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere temperatures 2. Indirect aerology.**—*M.R.*

12E–85 551.507.362.1:551.506.7(73/9

*†Newell, Homer E., Jr. (*U. S. Naval Research Lab.*), **Rocket data on atmospheric pressure temperature, density and winds.** *Annales de Géophysique*, Paris, 11(2):115–144, April/June **1955**

25 figs., 4 tables, 41 refs., 5 eqs. **DLC**—A comprehensive review of all of the important results obtained by rocket observations of pressure, density, temperature and wind since 1945, at White Sands and other places by the U. S. Navy, Signal Corps and Air Force. Rockets are illustrated and curves presented showing latest estimates of structure of these elements to 220 km in some cases. Data over the equator and at high latitudes are compared with those over New Mexico. Discussion includes: heating by ozone, measurement of pressure by X-rays, rocket grenade experiments (sound speed), the falling sphere experiment, the shock wave angle experiment, and U. S. A. F.-University of Michigan data obtained from impact pressure at the nose of an Aerobee. Not enough data exist to settle problems of diurnal vs seasonal and geographic variations. (*Same item as* 7.10–81 and 11I–4, *Met. Abs.*) *Subject Headings:* **1. Rocket data 2. Upper air data 3. United States.**—*M.R.*

12E–86 551.510.53:551.594.12:523.51

†Öpik, E. J., **Meteors of the upper atmosphere.** *Irish Astronomical Journal*, 3(6):165–181, June **1955. DLC.** Also issued as: *Armagh Observatory, Leaflet*, No. 30. 6 tables, 32 refs., 7 eqs. **DWB**—Discrepancies above 95 km between atmospheric densities calculated from meteor observations and rocket data are attributed to most meteors being fluffy aggregates which crumble into small fragments; only meteorites and the more brilliant meteors are solid masses. The consequences of this theory are discussed. New tables for the ionizing efficiency and penetration of meteor atoms are given and radar observations of meteor velocity discussed. (*Same item as* 7.8–103, July 1956, *Met. Abs.*) *Subject Headings:* **1. Meteor theories 2. Meteor ionization trails.**—*C.E.P.B.*

12E–87 551.594.51:551.524.7

Shepherd, G. G. and Hunten, D. M., **On the measurement of notational temperature from unresolved nitrogen bands.** *Journal of Atmospheric and Terrestrial Physics*, London, 6(6):328–335, June **1955.** 5 figs., 2 tables, 10 refs. **DWB**—Measurements of 180 auroral spectra on the 3914 Å band are described, including correction to give line intensities, neglect of which makes the temperature estimates too low. Temperatures varied from 150–465°K, mean 258°K. Classification by auroral type indicates an increase with height. Heights were obtained by double photograph on 35 occasions; height distribution of temperatures is irregular but not inconsistent with rocket temperatures. (*Same item as* 6.10–291 and 12A–221, *Met. Abs.*) *Subject Heading:* **1. Auroral temperatures.**—*C.E.P.B.*

12E–88 551.510.3:551.510.53:551.507.362.1

Smith, Haldon L.; Early, Harold C. and Spencer, Nelson W., **Rocket measurement of upper atmosphere density by Paschen's law.** Michigan. Univ. Engineering Research Institute, Contract AF 19(604)-545, Scientific Report, CS-3, May **1955.** 41 p. 15 figs. (incl. photos), foot-refs. **DWB**—The air density in the region adjacent to the surface of a supersonic cone in the upper atmosphere has been measured by means of a spark-breakdown technique based on Paschen's law. A spark gap was incorporated into the nose of an Aerobee rocket and consisted of alternate metal and dielectric laminations. The breakdown path was essentially parallel to the surface of the cone and provided for a measurement without changing the air flow past the missile. The spark-breakdown technique has evaluated by measurements taken in a large vacuum chamber, and investigations were made into the statistical deviation from the mean calibration curve, and of the consequences of initial ionization. The effects of the high air velocity upon the breakdown were also considered. The Paschen's law density measurements have been compared with data derived from Alphatron pressure gages included in the rocket instrumentation and were found to have a consistently lower value. This discrepancy is believed to be due largely to the influence of the boundary layer upon the location of the discharge path. (*Same item as* 6.11–165 and 11I–67, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere density 2. Rocket research.**—*Authors' abstract.*

1956

12E–89 551.521.326:546.2

Armstrong, E. B. (*Physics Dept., Queen's Univ., Belfast*), **The observation of line profiles in the airglow and aurora with a photoelectric Fabry-Perot interferometer.** (In: **The airglow and the aurorae: a symposium.** London, Pergamon, **1956.** p. 366–373. 4 figs., 8 refs., eqs.) **DWB**—Preliminary observations of the nightglow [OI] green line with a photoelectric Fabry-Perot interferometer are described. The temperature observed in a quiet auroral arc appeared to be in the neighborhood of 370°K. (*Same item as* 8B–135 and 12A–9, *Met. Abs.*) *Subject Headings:* **1. Photoelectric observation 2. Spectral line 5577 A [OI].**—*Author's abstract.*

12E–90 551.590.24:551.510.535:551.594.13

Burkard, Otto (*Inst. f. Met. und Geophysik, Graz Univ.*), **Temperature-controlled variations of the ionosphere during an eclipse.** (In: **Solar eclipses and the ionosphere: a symposium** . . . ed.

by W. J. G. Beynon and G. M. Brown. London, Pergamon, **1956.** p. 69–73. 4 figs., 2 eq
DWB—Hitherto the changes in foE and foF1 in an eclipse have been explained by the relati

$$\frac{dN}{dt} = D \cdot q_0 \cos \chi - \alpha' N^2,$$

where D is the fraction of unobscured sun's disk and α' a constant. But now we know that t
diurnal variation of foF is approximately proportional to $\cos^{\frac{1}{2}} \chi$, and for foF1 the diurnal variati
is represented by foF1 $\alpha \cos^m \chi$, where the values of m change approximately between 0.15 and 0.2
Such a variation can be explained by the assumption that there is a linear increase of temperatu
with height and a recombination coefficient $\alpha' = \alpha'_0 \cdot p^k \cdot T^n$ (p = pressure; k, n = indeterminate co
stants). An attempt to explain the changes in electron density at Khartoum during the eclipse
Feb. 25, 1952 has shown that, using the same relations, there is no necessity to assume any no
uniform distribution of the sources on the sun's disk as calculated by MINNIS. It is necessary
neglect the term dN/dt, but this may be a smaller error than to calculate with a constant recombin
tion coefficient (i.e., constant temperature). The term dN/dt can be neglected in the diurnal chang
in foE and foF1. The temperature at the height of maximum electron density decreases short
after the beginning of the eclipse, and increases rapidly after the eclipse maximum. (*Same item*
9.4–252, April 1958, *Met. Abs.*) *Subject Headings:* **1. Ionospheric electron density 2. Eclips
temperature drop 3. foF1 variations.**—*Author's abstract.*

12E–91 551.510.535:551.594.12(75

Burkard, O., **Die tages- und jahreszeitlichen Variationen der F1-Ionisation: ein Deutung
versuch.** [The daily and annual variations of F1 ionization and their interpretation.] *Journ
of Atmospheric and Terrestrial Physics*, London, 8(1/2):83–90, Feb. **1956.** 2 figs., 3 tables, 8 refs
10 eqs. English and German summaries p. 83. **DWB**—The relation $(f_0F_1)^2 = C^2 (\cos \chi)^x$ is verifie
and values of x and log C computed for Washington. The relation is explained by a linear increase
temperature with height in the F1 layer. The temperature gradient is smaller and the warm lay
thicker in summer than in winter. (*Same item as* 7.8–108, Aug. 1956, *Met. Abs.*) *Subject Heading*
1. Ionospheric variations 2. F1 layer ionization 3. Washington, D. C.—*C.E.P.B.*

12E–92 551.510.535:523.77:537.531:551.507.362.1:551.521.6

Byram, E. T.; Chubb, T. A. and Friedman, H. (*all, U. S. Naval Res. Lab., Wash., D. C.*), **Th
solar x-ray spectrum and the density of the upper atmosphere.** *Journal of Geophysical Researc
Wash., D. C., 61(2, Pt. 1):251–263, June **1956.** 5 figs., 3 tables, 11 refs., eqs. **DLC**—The flu
density of solar X-rays arriving in the E region of the ionosphere was measured by means of photo
counters in rockets. Flux densities as a function of altitude were obtained in the spectral banc
8 Å to 20 Å, 44 Å to 60 Å, and 44 Å to 100 Å. The data were extrapolated to zero air mass to giv
the respective flux densities in the three bands outside the atmosphere. To a first approximation
the observations may be fitted to a 700,000°K Planckian distribution of solar X-rays with a tota
flux density of about 0.1 erg cm^{-2} sec^{-1} at the earth. A more refined analysis reveals that it is a
over-simplification to assign a single temperature to the entire corona. The shortest wave lengths
8 Å to 20 Å, appear to have come from a hotter source, at a temperature between one and two millio
deg K. From the rate of X-ray absorption between 128 and 110 km and known mass absorptio
coefficients for air, the atmospheric density was computed to be about one-third the current Rocke
Panel average values. (*Same item as* 8.3–148 and 11I–73, *Met. Abs.*) *Subject Headings:* **1. Sola
X-ray spectrum 2. Ionospheric density 3. Rocket research.**—*Authors' abstract.*

12E–93 551.510.535:551.524.

Johnson, Francis S. (*U. S. Naval Res. Lab., Wash., D. C.*), **Temperature distribution of th
ionosphere under control of thermal conductivity.** *Journal of Geophysical Research*, Wash., D. C.
61(1):71–76, March **1956.** 2 figs., table, 12 refs., eqs. **DLC**—The effect of thermal conductivity i
controlling the temperature distribution of the high atmosphere is considered. The energy absorbe
in the F region is conducted downward into a denser region of the atmosphere, where it is dissipate
by infrared emission. The calculations indicate that the atmosphere is isothermal above abou
250 km, and that between 100 and 200 km there is a very strong positive temperature gradient. Th
temperature in the isothermal region is assumed to be 1100°K, in order to provide enough atmospher
near 300 km to support an F2 region. The low temperature at 80 km is due primarily to the lack o
absorbed energy there rather than to the presence of a strongly emitting layer at that level. (*Sam
item as* 8.11–158, Nov. 1957, *Met. Abs.*) *Subject Headings:* **1. Ionospheric temperature distributio
2. Thermal conductivity of air.**—*Author's abstract.*

12E–94 551.510.535/

Kallmann, H. K.; White, W. B. and Newell, H. E., Jr., **Physical properties of the atmosphere
from 90 to 300 kilometers: proposed "Speculative Atmosphere" submitted to the Working Grou

on Extension to the U. S. Standard Atmosphere Tables. *Journal of Geophysical Research*, Wash., D. C., 61(3):513–524, Sept. **1956.** 3 figs., 2 tables, 19 refs., 22 eqs. Erratum in [their]: **Physical properties of the atmosphere from 9 to 300 kilometers.** *Ibid.*, 62(1):168, March **1957.** fig. **Comments** by Gustavus J. Simmons, *Ibid.*, 62(2):327–328, June **1957.** 3 foot-refs., 6 eqs. **DLC.** Shorter version with similar title in: *U. S. Air Force. Office of Scientific Research, Vistas in Astronautics: first annual Astronautics Symposium, Feb. 1957.* pub. N. Y. Pergamon Press, **1958.** p. 130–134. 5 figs., 2 refs. **DWB** (629.1388 U581as)—Based on recent experimental and theoretical studies of the physical properties of the atmosphere at high altitudes, an average model atmosphere is presented for the region between 90 and 300 km. This model is consistent with the following assumptions: Molecular oxygen begins to dissociate appreciably only above 90 km; at around 140 km, about 30% of O_2 is still in the undissociated state; molecular nitrogen begins to dissociate above 220 km; the concentrations of molecular oxygen and nitrogen decrease with altitude exponentially; the temperature becomes isothermal in the region of the exosphere, approximately above 360 km. All physical quantities have been calculated from self-consistent equations as continuous functions of altitude, without assuming any particular form of the temperature gradient. The results show lower temperatures and densities throughout the region of the ionosphere than have been deduced previously. SIMMONS in his comment points out that the work at Lockheed Missile Systems Division on the development of an upper atmospheric model has proceeded along similar lines with those of KALLMANN, WHITE, and NEWELL, Jr., 1956, with the result that the rather intricate mathematical derivation of the formula given by these authors; requiring three pages of manipulation, can be replaced by the given algebraic substitution:

$$\frac{T_0}{T_h} = \frac{P_0 M_0}{P_n P_0}\left[\frac{P_h}{M_i} - C_i\right] \qquad \text{instead of} \qquad C_i = \frac{P_h}{M_i} - \frac{P_h}{M_h}$$

(*Same item as* 9.6–150, June 1958, *Met. Abs.*) *Subject Headings:* **1. Standard atmosphere 2. Upper atmosphere models 3. Exosphere.**—*Authors' abstract.*

12E–95 551.510.535:551.594.13(931)

King, G. A. M. and Cummack, C. H., **Electron distribution in the ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, London, 8(4/5):270–273, May **1956.** 5 figs., ref. **DWB**—Analysis of *h'f* records at Christchurch, New Zealand, gave contours of ionization at true heights 100 km upwards throughout the day. Daytime layers form when the sun strikes tangentially. The E layer is due to a different gaseous component, F1 and F2 to different radiation bands. In the late afternoon the electrons move upward about 100 km into a region of lower density. Thermal conductivity is high and temperature uniform. (*Same item as* 7.10–133, Oct. 1956, *Met. Abs.*) *Subject Headings:* **1. Ionospheric electron density 2. Christchurch, New Zealand.**—*C.E.P.B.*

12E–96 551.501.89:551.510.535:551.590.25:551.551:551.594.5

†Lovell, A. C. B., **Radio astronomy and the fringe of the atmosphere.** *Royal Meteorological Society, Quarterly Journal*, 82(351):1–14, Jan. **1956.** 13 figs., 54 refs. **DWB**—This Symons Memorial Lecture summarizes 6 branches of radio astronomy. Scintillation of radio stars is due to elongated ionized clouds in the F region about 400 km moving with an average speed of 100 m/s in 50°N to 360 m/s in the auroral zone. The apparent predominance of E-W and W-E motion may be due to the shape of the clouds. Drifts of radar reflections from ionized meteor trails at 70–120 km have given much information about semidiurnal and annual variation of winds. Scale heights, pressures and diffusion coefficients in the 100 km region can also be determined by radio-echo meteor techniques. Sec. 6 describes the investigation of auroras by radio echoes, including determination of drift velocities (which are probably not due to winds). Finally, the bearing of moon echoes on the total electron content of the ionosphere is mentioned. (*Same item as* 7.6–74, June 1956, *Met. Abs.*) *Subject Headings:* **1. Radio astronomy 2. Ionospheric winds 3. Ionospheric electron density.**—*C.E.P.B.*

12E–97 551.594.12:551.510.535:551.524.7

Mariani, F., **Temperatura e densità elettronica nella regione F della ionosfera.** [Temperature and electron density in the F region of the ionosphere.] *Annali di Geofisica*, Rome, 9(2):245–271, April **1956.** 10 figs., 18 refs., 39 eqs. English summary p. 268. **DLC**—A thorough experimental and theoretical treatment of the temperature and electron density anomalies of the F2 layer. These anomalies cannot be explained on the basis of diurnal or seasonal variations in temperature at heights equivalent to those of the F2 layer. The author assumes that the F1 and F2 layers originate in the same manner by an ionization process in which the F2 layer is formed by a diminution of the recombination coefficient with height and the boundary between F1 and F2 layers by a discontinuity in temperature gradient. Several models are developed for ionization regime at lat. 45° for summer and winter solstice day. From these curves some of the anomalies may be explained. (*Same item as*

9.3–282, March 1958, *Met. Abs.*) *Subject Headings:* **1. Ionospheric temperatures 2. Ionospher electron density 3. Electron density in F layers.**—*M.R.*

12E-98 551.510.3:551.510.

†Megrelishvili, T. G. (*Abastuman Astrophysical Obs.*), **O granitsakh primenimosti sumerechno metoda issledovaniia atmosfery.** [Limits of usefulness of the twilight method of studying t atmosphere.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.* No. 8:976–983, Aug. **1956.** 5 fig 5 tables, 30 refs. **DWB, DLC**—On the basis of twilight observations made over a period of yea the author establishes the difference of the unusual brightness of the twilight sky when the heig of the "twilight rays" exceed 80 km upon the zenithal distance of the sun. Possible sources of t twilight brightness are considered. Preliminary results of twilight measurements, according to t method of V. G. Fesenkov are presented; this method excludes the influence of repeated scatteri of light (simultaneous measurement of brightness at two points of the sky, studied in the vertic of the sun symmetrically with respect to the zenith). The values of atmospheric pressure a density up to a height of 120–130 km which are obtained, correspond satisfactorily with those c tained by means of rocket measurements. (*Same item as* 9.7–147, July 1958, *Met. Abs.*) *Subj Headings:* **1. Upper atmosphere density data 2. Twilight sky brightness measurements.**—*Tran of Author's abstract.*

12E-99 551.510.535:551.524

Shimazaki, Tatsuo, **The characteristics of the F2 regions as deduced from the daily variatio in the ionospheric layer.** *Japan. Science Council. Ionosphere Research Committee, Report Ionosphere Research in Japan*, 10(3):124–142, **1956.** 11 figs., 14 refs., 12 eqs. **DWB**—Summariz analytical results of the theoretical work involving two models of the ionosphere are presented a discussed. A general method for analysis of the ionospheric daily variations is demonstrated a some of the salient deductions derived are: **1.** The F2 layer is produced at a level higher than that the maximum electron production as a result of height-dependent coefficient. 2. A positive te perature (or scale height) gradient is a very important factor in the F2 region and the thermal e pansion during the daytime is larger in sunspot maximum years than in minimum and in summ and/or lower latitudes than in winter and/or higher latitudes. 3. The vertical drift velocity bei nonuniform the increase or decrease of amplitude and phase depend on altitude of formation of t F2 region. Seasonal and latitudinal variations do not depart significantly, from daily variatio except near the Equator. (*Same item as* 11F–134, June 1960, *Met. Abs.*). *Subject Headin* **1. Diurnal ionospheric variations 2. F2 layer 3. Ionospheric temperature gradient.**—*W.N.*

12E-100 551.507.362.1:551.510.

Singer, S. Fred (*Dept. of Physics, Univ. of Maryland*), **Research in the upper atmosphere w high altitude sounding rockets.** (In: Beer, Arthur (*ed.*), **Vistas in astronomy.** pub. London, 195 **1956.** Vol. 2:878–912. 23 figs., 3 tables, bibliog. p. 910–912.) **DLC, DWB** (520.82 B415v) High altitude rockets have been used to investigate extra-terrestrial radiations and the propert of the atmosphere. This article surveys the outstanding results achieved in these studies, includin direct measurements of the solar ultraviolet and X radiation; composition and energy spectrum the primary cosmic rays; the incidence of micrometeorites; the dependence on altitude up to 220 k of atmospheric pressure, density, temperature, and composition; the distribution of ozone wi height; evidence on the intensity and origin of the day airglow; the electron and ion density distri tion in the ionospheric layers up to 350 km; variation of the earth's magnetic field with altitud evidence of the location of ionospheric current sheets and conclusions about the conductivity of t ionosphere; high-altitude photography and its applications. Characteristics are given of hi altitude sounding rockets used in the U. S.: V-2, Aerobee, Viking and Deacon. Suggestions a made for overcoming some of their inherent limitations to allow expansion of possibilities of hi altitude studies. Arguments are presented for the usefulness of instrumented artificial satell rockets for astrophysical research. (*Same item as* 10.6–91 and 11I–85, *Met. Abs.*) *Subject Headin* **1. Upper atmosphere research 2. Rocket soundings.**—*Author's abstract.*

1957

12E-101 551.507.362.1:551.510

Blagonravov, A. A., **Issledovanie verkhnikh sloev atmosfery pri pomoshchi vysotnykh rak** [Investigation of the upper atmospheric layers by means of high altitude rockets.] *Akadem Nauk SSSR, Vestnik*, 27(6):25–32, June **1957.** 5 figs., 2 tables. **DLC.** Transl. by E. R. Ho into English as *National Research Council, Canada, NRC*-C2456. **DWB** (M07.362 B633st)—Ma details of the Soviet meteorological rockets and of the cosmic ray, pressure, density, compositi radiation and other experiments, including those with a dog that was catapulted out of the roc on descent and descended in a parachute (shown in photo), etc. are described in this informat

article. Data obtained by rockets showed pressure at 90 km $1.3 \cdot 10^{-3}$, $1.1 \cdot 10^{-3}$, and $1.0 \cdot {}^{-3}$, at 110 km $5.2 \cdot 10^{-3}$ and $5.3 \cdot 10^{-3}$. Temperature maxima was found at 46 km (280°–307°K), minima at 80 km. The vertical temperature gradient between 50–70 km remained unchanged (2.5°/km). Cloud photographs are also taken from 80 km or more height. (*Same item as* 10.6–89 and 11I–92, *Met. Abs.*) *Subject Headings:* **1. Soviet meteorological rockets 2. Rocket exploration of the upper atmosphere.**—*M.R.*

12E–102 551.510.535

Burkard, O. (*Inst. für Met. und Geop., Austria*), **A new F-layer model.** *Geofisica Pura e Applicata,* Rome 37:145–164, **1957.** 11 figs., 3 tables, 11 refs., 44 eqs. English and German summaries p. 145. **DLC**—The model originally constructed for the F1 layer is adapted to enable an investigation of both the F layers. Essential premises are: The ionization of a single constituent of atmosphere by monochromatic radiation; a positive temperature gradient in the F1 region, a temperature—independent from height—in the F2 region and a negative temperature gradient above the height of the F2 electron-peak; furthermore during the daytime strong heating in the F2 region. It is further assumed that the rate of electron loss in the F1 layer is proportional to the square of the density of the electrons, and in the F2 layer is in simple proportion to this density. It is also assumed that this electron loss stands in proportion to the power k of the pressure p, and to the power n of the absolute temperature T, as assumed in the original F1 layer model. The above mentioned assumption as to temperature conditions are essential to an understanding of the transition from static to dynamic conditions observed in the F2 layer. During the night and in the morning the F2 layer can be treated as a static problem, movement of air masses being of no great importance. Later in the day however, a labile stratification of air masses gives rise to such movement that the F2 layer can only be handled as a dynamic problem, particular attention being paid to the movement of the air. Numerous observational data are referred to in order to prove the practicability of the new model and, with the help of this model, to justify new assertions. It has been possible, for example, to calculate the yearly temperature variation at constant level in the F1 layer. A critical report upon the models, published recently by other authors, concludes this paper. (*Same item as* 10.1–187, Jan. 1959, *Met. Abs.*) *Subject Headings:* **1. F layer models 2. Electron density in F layers 3. F layer temperature gradient.**—*Author's abstract.*

12E–103 551.510.535:546.21:551.507.362.1

Byram, E. T.; Chubb, T. A. and Friedman, H. (*all, U. S. Naval Res. Lab., Wash., D. C.*), **The dissociation of oxygen at high altitudes.** (In: **The threshold of space,** ed. by M. Zelikoff. N. Y., Pergamon Press, **1957.** p. 211–216. 4 figs., 3 tables, 9 refs.) **DLC**—Rocket measurements were extended above 130 km to 200 km to obtain data of the dissociation of oxygen. This paper briefly reviews the photon counter technique which was used and presents some of the newer results. In a recent experiment, air density was simultaneously measured with oxygen density by observing the rate of absorption of soft X-rays. Table 2 shows the concentration of O_2 between 110–180 km, derived from three Aerobee flights. The percentage of dissociation is defined by

$$\% \text{ dissociation} = 1 - \frac{P(O_2)}{0.2\,P(\text{Air})}$$

where $P(O_2)$ is the density of molecular oxygen and $P(\text{Air})$ the density of air. The observation proved that the oxygen is far from completely dissociated at the highest altitudes reached so far. Atmospheric density obtained from X-ray transmission demonstrate that the measurements in the E region are about 2.5–3 times lower than the rocket panel density. The possibility of fitting present density results to an acceptable theory of F2 ionization is discussed. (*Same item as* 11I–94, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Oxygen dissociation 2. Ionospheric composition 3. Rocket data.**—*E.K.*

12E–104 551.547:551.510.3:551.510.53:551.507.362.1(789)

Horowitz, R. and LaGow, H. E. (*both, U. S. Naval Res. Lab., Wash., D. C.*), **Upper air pressure and density measurements from 90 to 220 kilometers with the Viking 7 Rocket.** *Journal of Geophysical Research,* Wash., D. C., 62(1):57–78, March **1957.** 14 figs., 17 refs., 18 eqs. **DLC.** The density and pressure of the atmosphere from 90 to 220 km above White Sands, N. Mex., were determined from the Viking 7 rocket flight on August 1951 at 11:00 a.m. MST. A Philips ionization gage was used to measure pressure and pressure changes on the side of the nose cone of the rolling rocket. Measured pressure in the 90 to 105 km region were corrected for velocity ram and residual gas, and were approximately one-fourth of the Rocket Panel values. The derived pressure of 3×10^{-7} mm Hg at 220 km is twice the corresponding Rocket Panel value. Densities were measured from 120 to 185 km and at 220 km. The 220 km density value of 9×10^{-8} gm/m^3 agrees with the Rocket Panel value. However, the density values at the lower altitudes are one-fourth to one-half

those of the Rocket Panel. These lower density values in the 100 to 130 km region are in good agreement with values obtained from X-ray absorption experiments. Scale heights (RT/Mg), derived from the density data above 140 km, are approximately a factor of two higher Rocket Panel values. *Subject Headings:* **1. Upper air density measurements 2. Upper air pressure measurements 3. Rocket observations 4. White Sands, N. Mex.**—*Authors' abstract.*

12E–105 551.510.3:551.541:523.5

Jacchia, Luigi G., **A preliminary analysis of atmospheric densities from meteor decelerations for solar, lunar and yearly oscillations.** *Journal of Meteorology*, Boston, 14(1):34–37, Feb. **1957.** 2 tables, 7 refs., 11 eqs. **DWB**—Densities deduced from 133 meteor paths photographed from 2 stations in New Mexico are discussed. Heights ranged from 74–110 km, mean 91.8. The variations of log ρ were analyzed for oscillations of 12, 12.42060, 6, 6.21030 hrs and 365.24 days, for all meteors except Geminids, and excluding shower meteors. Only the annual oscillation is statistically significant (amplitude twice probable error); maximum density in Aug. (*Same item as* 8.6–174, June 1957, *Met. Abs.*) *Subject Headings:* **1. Air density 2. Atmospheric waves 3. Meteor velocities.**—*C.E.P.B.*

12E–106 551.506.22:551.507.362.1

Poloskov, S. M. and Mirtov, B. A., **The study of the upper atmosphere by means of rockets at the Academy of Sciences, U.S.S.R.** *British Interplanetary Society Journal*, 15(2):95–100, April/June **1957.** "Paper presented at the Congrès International des Fusées et Engins Guidés et d'Équipements, Paris, 3–8 Dec. 1956." **DLC**—The Russian rocket program planned for IGY is outlined. It involves study of the atmospheric structure, movements, electrical properties, cosmic and UV rays, micrometeorites and corpuscular rays from the sun at high altitudes. Particulars of the rockets, the ejected instrument containers (parachuted to the ground), the composition of the atmosphere at 80–95 km, pressure at 50–110 km, wind direction and speed at 60–80 km, etc. are given. (*Same item as* 10.3–39, March 1959, *Met. Abs.*) *Subject Headings:* **1. Soviet IGY rocket program 2. IGY rocket program 3. Upper atmosphere research. I. Dorling, E. B.** (*transl.*)—*M.R.*

12E–107 551.510.5:551.508.91

Simmons, Gustavus J. (*Dept. of Physics, Univ. of Oklahoma, Norman*), **An appraisal of photon counter measurements of upper atmosphere parameters.** *Journal of Geophysical Research*, Wash., D. C., 62(4):565–571, Dec. **1957.** 2 figs., table, 5 refs., 9 eqs. **DLC**—A model atmosphere is computed consistent with the measurements of O_2 concentration and ambient density between 100 and 125 km made by Byram, Chubb, and Friedman (*see* 1 and 2 of "References" at end of paper) of the Naval Research Laboratory and the parameters of the Rocket Panel model atmosphere (5) below 60 km. The resulting temperature gradient above 100 km is greater than can be supported by the atmosphere (4). No physically reasonable alteration of the temperature profile in the 60 to 100 km region produces acceptable temperature gradients above 100 km. It is concluded that the densities given by photon counting technique are incompatible with other atmospheric information, and are probably consistently low; and, further, that if the general nature of the density variation as determined by this technique is correct, the resulting temperature segment above 100 km is essentially the same as derived by F. Jounson (4) from considerations of thermal conductivity. (*Same item as* 9.8–154, Aug. 1958, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere structure 2. Photon counter measurements.**—*Author's abstract.*

12E–108 551.510.3:551.507.362.2

Sterne, T. E. and Schilling, G. F. (*both, Astrophysical Obs.*), **Some preliminary values of upper atmosphere density from observations of U.S.S.R. satellites.** *Smithsonian Institution. Astrophysical Observatory, IGY Project No. 30.10, Special Report*, No. 3, Nov. 15, **1957.** 10 p. 14 refs. **DWB** (629.1388 S661so). Also issued in "edited form" as *Smithsonian Contributions to Astrophysics*, Wash., D. C., 2(10):207–210, **1958. DWB, DLC**—On the basis of available orbital data for the U.S.S.R. Satellites 1957 Alpha One, Alpha Two, and Beta One, preliminary value of atmospheric density have been calculated for the respective perigee altitudes. The computations necessarily involve a number of speculative assumptions with regard to mass-area ratios, but the results show a reasonable consistency in numerical values derived from the three satellites independently. It would appear that the atmospheric density at altitudes between 220 km and 230 km is somewhat higher than has often been assumed. While the values derived here must be considered as being of an extremely tentative nature, it is expected that similar methods of calculation will, in the future, permit the inference of atmospheric density over a wide range of altitudes from orbital data. (*Same item as* 9.11–84 and 11J–165, *Met. Abs.*) *Subject Headings:* **1. Satellite observations 2. Air density calculations.**—*Authors' abstract.*

1958

12E–109 535.4:551.521.326:551.594.5

Armstrong, E. B., **Largeur de la raie OI λ5 577 du ciel nocturne et des aurores.** [Width of the line OI λ5 577 of the airglow and auroras.] *Journal de Physique et le Radium*, Paris, 19(3):358–365, March **1958.** 7 figs., 2 tables, 14 refs. French and English summaries p. 358. **DLC**—Observations of the OI green line profiles in the airglow and auroras, made with a photoelectric Fabry-Perot interferometer, are described. The temperature of the region emitting the airglow radiation appears to be between 180°K and 220°K, the most likely value indicated being 190°K. Auroral regions emitting the green line appear to range in temperature from 255°K to 540°K. A method of estimating line widths from fringes in the presence of background light is described. (*Same item as* 10.1 238, Jan. 1959, *Met. Abs.*) *Subject Headings:* **1. Fabry-Perot interferometer 2. Airglow 3. Auroras.** —*Author's abstract.*

12E–110 551.557:551.524.7:551.510.535

Beynon, W. J. G. and Goodwin, G. L. (*both, Dept. of Physics, Univ. College, Swansea*), **Horizontal drifts and temperature in the lower part of region *E*.** *Journal of Atmospheric and Terrestrial Physics*, London, 13(1/2):180–182, Dec. **1958.** 2 figs., 7 refs. **DLC**—Methods for investigating the ionosphere by signals from short or medium wave broadcasts are demonstrated. Some results obtained in the noon period in the summer and winter of 1957 and 1957–58 at the Department of Physics, University College of Swansea, in relation to other measurements of *E* layer movements made in Great Britain, are evaluated. The illustrations, showing a plot of direction of drift against height at noon for the summer and winter seasons as well as the height gradient in the magnitudes of the observed drift velocities, support the result of evaluation of a correlation between the magnitude of the drift velocity and temperature in the high atmosphere. *Subject Headings:* **1. Ionospheric temperatures measurement techniques 2. E layer.**—*O.T.*

12E–111 551.594.5:551.506.22

†Currie, B. W. (*Prof. Physics, Univ. of Saskatchewan, Saskatoon, Canada*), **Upper atmospheric research.** *Boletín Bibliográfico de Geofísica y Oceanografía Americanas*, Mexico City, Vol. 1, Parte Geofísica, issued **1958.** p. 127–130. 23 refs. **DPU**—A brief review of Upper Atmosphere Research Program at the University of Saskatchewan (52°N, 106.6°W) which deals mainly with spectroscopy of the auroral, twilight and airglow emissions; with auroral-ionospheric relationships and with supervision of IGY auroral and magnetic program for west-central Canada, and analysis of resulting data. Also the University is cooperating in the auroral spectroscopy and height measurements for U. S. rocket firings at Churchill (58°N, 94°W). Spectrograph equipment is described. Results of identification in 3300 to 20,000 Å region and of incident temperature at auroral levels, height of Na layer, etc. are mentioned and a list of papers on the subjects involved appended. (*Same item as* 12A–56, Jan. 1961, *Met. Abs.*) *Subject Headings:* **1. Auroral research 2. IGY auroral program 3. Saskatchewan, Saskatoon.**—*M.R.*

12E–112 551.507.362.2:521.312:551.510.53:551.510.3

El'iasberg, P. E., **Oprèdelenie plotnosti verkhneĭ atmosfery po vekovym izmeneniiam elementov orbit pervykh dvukh iskusstvennykh sputnikov zemli.** [Determination of the density of the upper atmosphere from the secular changes in the elements of the orbits of the first two artificial earth satellites.] *Iskusstvennye Sputniki Zemli*, Moscow, No. 1:21–24, **1958.** 3 tables, 4 refs., 5 eqs. **DLC.** Transl. into English in *Artificial Earth Satellites*, N. Y., Plenum Press, vol. 1:25–29, **1960. DWB**—The determination of the influence of atmospheric resistance on the secular variation of the elements of a satellite orbit is carried out by the equations:

$$\Delta T = -\frac{3\pi}{\sqrt{\mu}} b\rho_\pi a^{5/2} \cdot \frac{1+e}{1-e}\sqrt{1-e^2}\, f_0 \sqrt{\frac{2\pi}{\nu}}$$

$$\Delta e = -b\rho_\pi a(1+e)\sqrt{1-e^2}\, f_1 \sqrt{\frac{2\pi}{\nu}}$$

$$\Delta r_\pi = -b\rho_\pi a\sqrt{1-e^2} f' \frac{1}{2v}\sqrt{\frac{2\pi}{\nu}}$$

where ΔT, Δe, Δr_π = variation of the period of rotation T_1 of the eccentricity of the orbit e and of the perigee distance r_π for one rotation of the satellite about the earth; a = large semiaxis of the orbit, μ = product of the gravitational constant and mass of the earth, ρ_1 = density of the air at the point where the orbit is nearest the earth, $\nu = aek$ (coefficient determining the dependence of density ρ on height), and b = ballistic coefficient. From the long period variations of ΔT, Δe and Δr_π the

values ρ_π and k characterizing the atmospheres in the perigee of the orbit can be computed. The errors determining atmospheric density ρ for any height h due to k_{min} depend upon errors in k_{min}, ΔT, k and b, and are expressed by the equations:

$$\frac{\delta\rho\pi}{\rho} = k\delta h_{min}$$

$$\frac{\delta\rho\Delta T}{\rho} = \frac{\delta(\Delta T)}{\Delta T}$$

$$\frac{\delta\rho_b}{\rho} = \frac{\delta b}{b}$$

$$\frac{\delta\rho_0}{\rho} = \frac{1}{2} \cdot \frac{\delta b}{k}$$

The results of calculations of ρ on the basis of data from the first two Sputniks and the rocket carrier of Sputnik I are presented in a table. (*Same item as* 11J–38, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere density measurements 2. Orbital elements 3. Soviet satellites.**—*I.L.D.*

12E–113 551.507.362.2:551.510.3

Groves, G. V. (*Dept. of Physics, Univ. Coll., London*), **Irregularities of satellite drag and diurnal variations in density of the air.** *Nature*, London, 182(4648):1533–1534, Nov. 29, **1958.** ref. [Comment (entitled **Atmospheric tides and earth satellite observations**)] by D. G. Parkyn [and] **Reply** by Groves. *Ibid.*, 183(4667):1045–1047, April 11, **1959.** 2 figs., 4 refs., eq. **DWB**—The marked change in the slope of the period-time curves of Sputnik 2, Sputnik 3 and Sputnik 3 rocket has led to the belief that the density of the air at a height of 220 km increases considerably between latitude 35°N and 28°N. The sudden increase in drag is considered instead to be associated with the passage of the perigee from the night-side to the day-side of the Earth, so that the change results chiefly from the precession of the orbital plane instead of from the rotation of the perigee in the orbital plane. This explanation accounts more easily for the suddenness of the change, since the orbital plane precesses about ten times faster than the perigee rotates in the orbital plane. The solar heating that seems to be responsible for the increase in density at 220 km occurs probably in the region of 100 km and the expansion of the air at this level lifts the atmosphere above. Tidal variation in the density could be studied with spherical satellites which eliminate the fluctuations in the period-time curve due to the changes of aspect in the rocket. (*Same item as* 11J–60, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Atmospheric drag 2. Satellite orbits 3. Soviet satellite, 1957 Beta (Sputnik II) 4. Soviet satellite, 1958 Delta (Sputnik III).**—*I.L.D.*

12E–114 551.510.535/6:551.507.362.1(917.1)

Horowitz, R. and LaGow, H. E. (*both, U. S. Naval Res. Lab., Wash., D. C.*), **Summer-day auroral-zone atmospheric-structure measurements from 100 to 210 kilometers.** *Journal of Geophysical Research*, Wash., D. C., 63(4, Pt. 1):757–773, Dec. **1958.** 11 figs., 11 refs., 8 eqs. **DWB, DLC**—The density and pressure of the atmosphere from 100 to 210 km above Fort Churchill, Manitoba, Canada, were determined from the IGY NN3.13F Aerobee-Hi rocket flight on July 29, 1957, at 4:00 p.m., CST. Two magnetic cold-cathode ionization gages were used to measure pressure and pressure changes on the side of the rolling rocket. Excellent agreement was obtained (a) between both gages throughout flight, and (b) between ascent and descent measurements. Measured pressures in the region from 100 to 120 km were corrected for a residual gas pressure of approximately 2×10^{-5} mm Hg. An ambient pressure of 10^{-5} mm Hg was obtained at 107 km. The derived pressure of 4×10^{-5} mm Hg at 210 km is an order of magnitude greater than the corresponding 1951 values measured at the White Sands Proving Ground, N. Mex. Densities were measured from 125 to 210 km. The density value of 6×10^{-7} gm/m^3 at 210 km is five times greater than the 1951 measurement, while at 140 km the difference is a factor of two. Scale heights (RT/Mg) were derived from the measured pressure and density data vs. altitude, using the hydrostatic equation. The scale-height value obtained at 210 km was 95 kilometers, and the scale-height gradient from 190 to 210 km was 0.1 km/km. (*Same item as* 11I–200, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere structure 2. Aerobee-Hi rockets 3. Ft. Churchill, Canada.**—*Authors' abstract.*

12E–115 551.524.7:551.510.535

Johnson, Francis S. (*Lockheed Aircraft Corp., Palo Alto, Calif.*), **Temperatures in the high atmosphere.** *Annales de Géophysique*, Paris, 14(1):94–108, Jan./March **1958.** 11 figs., 15 refs. French and English summaries p. 94. **DLC**—The temperature distribution of the high atmosphere is discussed on the assumption that the ionosphere is heated primarily by solar radiation and that the temperature distribution is controlled by thermal conduction. A model is presented which

agrees well with the rocket observations and with most of the radio observations, and in which the thermal conduction is consistent with the absorption of solar energy. The amounts of solar energy are in agreement with the rocket observations in those spectral regions in which observations have been made. However, no observations have been made in the spectral region which is most important with regard to controlling the temperature of the F region of the ionosphere. The amount of solar energy which must be assumed to be present in this spectral region in order to give a thermally consistent model with temperatures as high as those required by rocket and radio observations is not unreasonable from an astrophysical viewpoint. (*Same item as* 10.1–253, Jan. 1959, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. F layer 3. Ionosphere.**—*Author's abstract.*

12E–116 551.510.53:551.510.3:551.507.362.1(917.1)

LaGow, H. E.; Horowitz, R. and Ainsworth, J. (*all, U. S. Naval Res. Lab.*), **Rocket measurements of the Arctic upper atmosphere.** *International Geophysical Year, 1957/1958. IGY World Data Center A (Rockets and Satellites), IGY Rocket Report Series*, No. 1, July 29, **1958.** p. 26–37, 11 figs., 9 refs., eq. **DWB.** Also in: *Annales de Géophysique*, Paris, 14(2):131–139, April/June **1958.** —A review is presented of the structure of the Arctic upper atmosphere as measured by rockets in the summer of 1953 and 1954. Tentative results are reported for Aerobee-Hi rockets fired at Ft. Churchill, Canada in the winter of 1956 and the summer of 1957. A comparison of those results shows: 1) at 200 km the summer daytime atmospheric density at 59°N is 2.5 times the winter daytime value and it is 20 times the winter nighttime value. This summer daytime value is 6.5 times the corresponding White Sands value of 1.4×10^{-7} g/m^{-3} and 2) between 30 and 45 km, density measurements indicate that seasonal and latitude variations are less than 10% while summer pressure measurements show Arctic temperatures and pressures to be significantly higher than White Sands value. This meridional pressure gradient leads to an easterly geostrophic wind in general agreement with anomalous sound and high altitude balloon measurements. (*Same item as* 10.6 39 and 11I–120, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere density measurements 2. International Geophysical Year, 1957–1958 3. Aerobee-Hi rockets 4. Ft. Churchill, Canada.**—*E.K.*

12E–117 551.510.3:551.510.53:551.507.362.1:551.506.22(917.1)

LaGow, H. E.; Horowitz, R. and Ainsworth, J. (*all, U. S. Naval Res. Lab.*), **Arctic atmosphere structure to 250 km.** *International Geophysical Year, 1957/1958. IGY World Data Center A (Rockets and Satellites), IGY Rocket Report Series*, No. 1, July 29, **1958.** p. 38–46. 9 figs., 8 refs. **DWB**—The results of three Aerobee-Hi rocket observations at Ft. Churchill show: 1) the summer densities from 30 to 70 km at 59°N are approximately 5 to 10% higher than the Rocket Panel values for 33°N, 2) the winter densities from 25 to 40 km are 10 to 20% lower than the corresponding summer values at 59°N; thus they are 5 to 10% lower than the 33°N Rocket Panel values, 3) the daytime atmospheric density at 200 km at 59°N is higher both in the summer and in the winter than the summer value of $1.4\pm.5\times10^{-7}$ g/m^3 for 33°N obtained in August, 1951. At 59°N and 200 km altitude the summer value is $6.7\pm2\times10^{-7}$ g/m^3 while the corresponding winter value is 3.6 ± 3, -1.5×10^{-7} and 4) the summer atmospheric pressure at 110 km at 59°N is $(6.5\pm.8)\times10^{-5}$ mm Hg and is a factor of 2.5 higher than the corresponding 33°N value. A tentative result from the third flight has been obtained. This winter night flight gives density values of $1.3\pm.6\times10^{-7}$ g/m^3 at 202 km above 59°N. (*Same item as* 11I–120, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere density data 2. Rocket observations 3. International Geophysical Year 1957–1958 4. Ft. Churchill, Canada.**—*K.E.*

12E–118 551.510.3:551.507.362

LaGow, H. E. and Horowitz, R., **Comparison of high-altitude rocket and satellite density measurements.** *Physics of Fluids*, N. Y., 1(6):478-479, Nov./Dec. **1958.** fig., 6 refs. **DWB**—Atmospheric density measurements obtained with rocket-borne ionization gages are compared with U. S. and U.S.S.R. satellite-drag measurements. There is no significant disagreement between the results obtained by the two methods once atmospheric variations are taken into account. (*Same item as* 11I–122, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere densities 2. Rocket ionospheric data 3. Satellite density measurements.**—*Authors' abstract.*

12E–119 551.507.362

Massey, H. S. W., **Rockets and satellites in scientific research.** *Endeavour*, London, 17(66):85–89, April **1958.** 2 refs., 4 eqs. **DLC**—Usefulness of rockets in obtaining ionospheric and high atmospheric composition, temperature, density, ionization and radiation data; limitations in time aloft which are overcome by use of satellites, a history of sounding rockets, their instrumentation and future prospects, the orbits and some of the results of the first U. S. and Soviet satellites are reviewed for general information. The results of ejection of sodium vapor and of NO at high altitudes (40–60 mi) are also discussed. The fluorescence from the sodium vapor cloud persisted for 20 min, even at points 300 mi away from the launching site. (*Same item as* 10.6–85 and 11I–124, *Met. Abs.*)

Subject Headings: **1. Rocket soundings 2. U. S. satellites 3. Soviet satellites 4. Satellite observations.**—*M.R.*

12E–120 551.507.362.1:551.510.53:551.547:551.510.3

Mikhnevich, V. V., **Predvaritel'nye rezul'taty opredeleniia plotnosti atmosfery vyshe 100 km.** [Preliminary results of the determination of atmospheric density at heights above 100 km.] *Iskusstvennye Sputniki Zemli*, Moscow, No. 2:26–31, **1958.** 5 figs., 2 tables, 9 refs., eq. **DLC.** Transl. into English in **Artificial Earth Satellites.** N. Y., Plenum Press, **1960.** Vol. 2:32 39. **DWB**—With the aid of diagrams the author describes the construction of a thermal ionizing and magnetic manometer for measuring atmospheric density and pressure within the limites of 10^{-5}—10^{-9} mm Hg. In order to diminish light currents from the condenser the latter was made of fine wires. By means of a supplementary circuit between the cathode and anode a self stabilizing emission current is produced. The possible errors in determining atmospheric pressure and density are examined. By means of suitable hermetic sealing and by selection of construction materials having a low vapor pressure, the discharge of gas by the rocket or satellite would exert practically no influence on the measurement of atmospheric pressure or density if the gas was excluded from coming into contact with the manometer. As a result of dissociation of the air molecules errors arise, since the manometer was calibrated for the ordinary atmosphere. The results of measurements of atmospheric density by rockets and satellites are presented in a graph. The atmospheric density was measured from the pressure by the formula $N = P_1 \sqrt{\frac{1}{2nmk}} \cdot \frac{1}{PT_1 v \sin\theta}$ where P_1 = pressure within the manometer, v = velocity of satellite or rocket, θ = angle between the velocity vector and plane of opening of the manometer, k = Boltzmann constant, m = mass of the molecule. Tables giving atmospheric density as measured by containers in rockets and density measurements obtained by different investigations are presented. The measurements indicate an increase in the height of the uniform atmosphere. The pressure within the manometer depends upon the orientation of the satellite. (*Same item as* 11I–126, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere density measurements 2. Rocket data 3. Satellite data 4. Manometers.**—*I.L.D.*

12E–121 551.510.53:551.506.22:551.507.362.1

Newell, Homer E., Jr., **First year of the U. S.-IGY Rocket Program.** *International Geophysical Year, 1957/1958. IGY World Data Center A (Rockets and Satellites), IGY Rocket Report Series*, No. 1, July 29, **1958.** p. 1–10. 9 tables. **DWB**—The article summarizes the results obtained in the following fields; atmospheric pressure, temperature and density, wind, high altitude photography, chemical composition, ion composition, ionospheric electron density, solar radiation, airglow, auroral radiation, auroral particles, rocket astronomy, cosmic rays, geomagnetic field. The observations were made by some 116 upper air sounding rockets which the United States launched during the first 12 month of the IGY. (*Same item as* 11I–120, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. IGY rocket program 2. Upper atmosphere structure 3. Upper atmosphere physics 4. Upper atmosphere composition.**—*E.K.*

12E–122 551.507.362.2

Paetzold, H. K., **Die ersten künstlichen Erdsatelliten (Das Internationale Geophysikalische Jahr, XIII).** [The first artificial earth satellites (The International Geophysical Year, Pt. 13).] *Die Umschau*, Frankfurt a.M., No. 1:3–7, **1958.** 7 figs. **DWB, DLC**—Details of the first two Soviet satellites, their trajectories, tracking and variations are discussed, along with the first preliminary scientific results. It appears that atmospheric density at 200–250 km is about double the value assumed in the past. Radio signals are being received from satellites far below the horizon which would indicate that radio waves are channeled along the ionosphere for some time before penetrating into the lower atmosphere. (*Same item as* 10.7–92 and 11J–126, *Met. Abs.*) *Subject Headings:* **1. Satellite laboratories 2. Soviet satellite, 1957 Alpha (Sputnik I) 3. Soviet satellite, 1957 Beta (Sputnik II).**—*G.T.*

12E–123 551.507.362.2:551.510.536:523.51

Petri, W. (*Schliersee/Obb.*) and Faust, H. (*Offenbach*), **Neue Satelliten-Ergebnisse.** [New satellite findings.] *Naturwissenschaftliche Rundschau*, Stuttgart, 11(12):460–461, Dec. **1958.** fig. **DWB, DLC**—There are four brief notes entitled: (1) **Density variation of the upper atmosphere.** G. HERGENHAHN discovered that the orbital period of Sputnik 2 and Sputnik 3 decreased (up to 40%) rather than increased. The discovery was made while analyzing the Doppler effects of the satellite-borne radios. The phenomenon may be due to a drop of 25 km of the atmosphere, or less plausible, less air friction due to self-orientation of the cone shaped satellite exposing least resistance surface. (2) **Micrometeorites.** The 10 kg Vanguard, fired May 27, 1958, reached about 3000 km altitude and was hit by 17 micrometeorites during ten minutes. Assuming that these figures are representa-

tive, the earth is bombarded at least five times heavier than was believed. (3) **Contour of the earth.** U. S. 1958 Alpha and Beta 2 satellite observations show that the earth is not as flat as assumed. The difference is 200 m in favor of the polar diameter vs. the equatorial. The observations of U.S.S.R. satellite, 1957 Beta, made by the English Air Force Research Establishment at Farnborough found the earth's oblateness to be 1/298.1 rather than 1/297.1. (4) **State of the upper atmospheric layers on bases of satellite measurements.** PAETZOLD'S remarkable results, showing a very active dynamic of the upper atmosphere, were arrived at with the aid of Sputnik 1 and Sputnik 3. Electron density, ionization, air density and temperatures are briefly discussed. The density of air at 225 km altitude above the equator is only half of the density of the air above the pole. The density and temperature decline from the pole toward the equator is associated with strong E-W winds. (*Same item as* 11J–134, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere density variations 2. Micrometeorites 3. Earth's oblateness 4. U. S. satellites 5. Soviet satellites.**—*W.N.*

12E–124 551.507.362.2:621.396

*Priester, Wolfgang; Bennewitz, Hans-Gerhard and Lengrüsser, Peter, **Radiobeobachtungen des ersten künstlichen Erdsatelliten.** [Radio observations of the first artificial satellite.] *Arbeitsgemeinschaft für Forschung des Landes Nordrhein-Westfalen, Wissenschaftliche Abhandlungen*, Vol. 1, issued Cologne (Westdeutscher Verlag), **1958.** 38 p. 21 figs., 4 tables, 5 refs., 29 eqs. **DLC** (QC802.B64P7). Review by S. F. Singer in *Physics Today*, 11(7), July **1958.**—Trajectory data and their time variations due to precession and to friction in the earth's atmosphere were calculated from measurements of Doppler effect and recordings of signal field strength at 20 and 40 MHZ. The trajectory data are presented. For the precession of the trajectory, the authors obtained 2.96 ±0.20°/d in good agreement with the theoretical value of D. G. KING-HELE and D. M. C. GILMORE. For atmospheric limits at 215 km (over the mean globe [$R=6371$ km] at 42°N lat.), a value of $4.7 \cdot 10^{-13}$ g cm^{-3} was obtained. This value is five times as large as the density obtained for that altitude from American rocket experiments in 1952/53. (*Same item as* 11J–137, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Radio observation techniques 2. Doppler effect 3. Upper atmosphere densities.**—*Transl. of authors' abstract (G.T.).*

12E–125 551.507.362.2:551.510.53:551.510.3

Sterne, Theodore E. (*Harvard College Obs., Camb., Mass.*), **Density of the upper atmosphere.** *Science*, Wash., D. C., 128(3321):420, Aug. 22, **1958.** 8 refs. **DLC.** Reprinted in *IGY*, 1957/1958. *IGY World Data Center A, Rockets and Satellites, IGY Satellite Report Series*, No. 3:10–14, May 1, **1958.** 7 refs., 6 eqs. **DLC**—Brief contribution on the difference of density values as obtained theoretically by the ARDC model atmosphere vs. the observation by U. S. Explorer I which was 1.5×10^{-13} g/cm^3 at 368 km or 14 times the model value, and the observation by the U.S.S.R. Alpha 2 which was 4.5×10^{-13} g/cm^3 at 220 km or 9 times the model value. From observations of both satellites together the infrared density values of about 1.4×10^{-14} g/cm^3 at 368 km and 4.0×10^{-13} at 220 km do not agree so well with HARRIS and JASTROV'S results as they tend to align with the curve by STERNE and SCHILLING. (*Same item as* 11J–163, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Atmospheric models 2. Upper atmosphere density data 3. U. S. satellite, 1958 Alpha (Explorer I) 4. Soviet satellite, 1957 Alpha (Sputnik I).**—*W.N.*

12E–126 551.510.53:551.510.3:551.550.3:061.3:551.507.362.1(917.1)

Townsend, J. W., Jr. (*U. S. Naval Res. Lab.*), **Atmospheric structure above Ft. Churchill.** *International Geophysical Year, 1957/1958. IGY World Data Center A (Rockets and Satellites), IGY Rocket Report Series*, No. 1, July 29, **1958.** p. 11–13. 3 figs. **DWB**—This report covers the observations made in 1956–1957 by three Navy Aerobee-Hi rockets. It was concluded that the density of the high atmosphere in the region near 200 km is under strong solar control and a diffusive separation of argon and nitrogen is present in the winter nighttime Arctic atmosphere above Ft. Churchill in the region 110–150 km. (*Same item as* 11I–120, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere densities 2. International Geophysical Year, 1957–1958 3. Ft. Churchill, Canada.**—*E.K.*

12E–127 551.510.3:551.510.53:551.507.362.1(917.1)

Townsend, J. W., Jr. and Meadows, E. B. (*both, U. S. Naval Res. Lab.*), **Density of the winter nighttime Arctic upper atmosphere 110 to 170 km.** *International Geophysical Year, 1957/1958. IGY World Data Center A (Rockets and Satellites), IGY Rocket Report Series*, No. 1, July 29, **1958.** p. 14–25. 7 figs., 6 refs., 5 eqs.) **DWB.** Also in: *Annales de Géophysique*, Paris, 14(1):117–130, Jan./March **1958.**—The density of the Arctic atmosphere during the winter night has been measured over the interval 110 to 170 km by means of a mass spectrometer mounted in an Aerobee-Hi rocket. The rocket, IGY NN3.17 (NRL-48) was fired at 2321 hrs CST on Nov. 20, 1956 at Ft. Churchill, Canada. The primary purpose of the flight was to obtain data on the composition of the upper

atmosphere, but due to a fortunate rocket attitude on the ascent of the rocket it has also been possible to determine atmospheric density during the time mass spectra were obtained. The density profile obtained is higher than that found above White Sands in the region 110–145 km and lower above this level. (*Same item as* 10.1–147 and 11I–120, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere density measurements 2. International Geophysical Year 1957–1958 3. Aerobee-Hi rockets 4. Ft. Churchill, Canada.**—*Authors' abstract.*

12E–128 551.507.362.1:551.510.53:016

†Townsend, J. W., Jr., Friedman, H. and Tousey, R., **History of the Upper-Air Rocket-Research Program at the Naval Research Laboratory, 1946–1957.** *U. S. Naval Research Laboratory, NRL Report* 5087, Feb. 21, **1958.** 47 p. 13 figs., over 300 refs. **DWB** (M11 U58u). Review in *Nature*, London, 182(4633):431, Aug. 16, **1958.**—A review of the basic research program of the Naval Research Laboratory since 1946 when it undertook to study the physics of the upper atmosphere (above 100,000 ft) by means of high altitude sounding rockets. The work on pressure, temperature, density and winds, on gas and ion composition, on solar radiation by optical spectrograph and by photo-counting techniques, on electron density in the ionosphere, on airglow, cosmic radiation, auroral particles, meteors, geomagnetic field, earth photography and conductivity and application of the data obtained from 104 rocket soundings, along with a bibliography on each of the above subject fields (made up of over 300 reports and papers of NRL scientists), is included in this illustrated report. (*Same item as* 11I–138, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Rocket research programs 2. Upper atmosphere bibliographies 3. U. S. Naval Research Laboratory.**—*M.R.*

12E–129 551.594.5:551.506.7(481):551.521.67

†*Vegard, L.; Berger, S. and Nundal, A., **Results of auroral observations at Tromsø and Oslo fom the four winters 1953–54 to 1956–57.** *Geofysiske Publikasjoner*, Oslo, 20(9), **1958.** 36 p. figs., tables, 19 refs. **DWB, DLC**—This excellent monograph is based on an analysis of auroral spectrograms made at the Tromsø Auroral Observatory and the Physical Institute at Oslo during 4 winters 1953–57. The "V" spectrograph with great dispersive power and the "F" spectrograph of great light power were used at Tromsø; and the "C" and "A" spectrographs at Oslo. Fifteen "V" spectrograms and 139 "F" spectrograms were secured. The theory of solar-terrestrial relationships being tested in this study is that the bundles which produce the aurora and magnetic-ionospheric disturbances in the polar regions have the same general structure as the streamers of the solar corona, although the x-rays producing auroral bundles come from relatively narrow and highly ionized sunspot areas which produce x-rays whose photon energy is >10 times greater than coronal x-rays. Ionospheric temperatures and proton velocities are calculated from the spectrograms and the temperature was found to be the same at top and bottom. Instruments are described and results presented in detailed tables. It is concluded that all celestial bodies surrounded by an atmosphere and hit by strong x-rays will develop the coronal structure (e.g., stars, planets and comets exposed to x-ray from sun or star spectrograms). Also it is concluded that enhancement of red OI-doublet is not produced by electrons, but is due to the positive rays (mainly protons) in the bundle. This enhancement is very pronounced and occurs at great altitudes up to 600 km. (*Same item as* 11.6–122, June 1960, *Met. Abs.*) *Subject Headings:* **1. Auroral data 2. Coronal effect of solar x-rays 3. Ionospheric temperatures 4. Red OI-doublets 5. Norway.**—*M.R.*

1959

12E–130 551.521.326:551.524.7:551.594.51

†Armstrong, E. B. (*Queen's Univ. of Belfast*), **The temperature in the atmospheric region emitting the nightglow OI 5577 line in regions above faint auroral arcs.** *Journal of Atmospheric and Terrestrial Physics*, London, 13(3/4):205–216, Feb. **1959.** 3 figs., table, 35 refs. **DLC**—A number of observations of nightglow and auroral temperatures made with photoelectric scanning Fabry-Perot interferometer are presented and discussed. The results suggest that the temperature of the region emitting the nightglow λ5577 radiation lies within the range 180° to 220°K, with most likely value of 190°K. Temperatures measured above faint auroral arcs ranged from 310° to 540°K. The published temperatures of the upper atmosphere obtained spectroscopically are surveyed. (*Same item as* 11.5–132, May 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere temperatures 2. Auroral temperatures 3. Night airglow temperatures.**—*Author's abstract.*

12E–131 551.507.362:551.524.77:551.510.536

†Bates, D. R. (*Queen's Univ., Belfast*), **Some problems concerning the terrestrial atmosphere above about the 100 km level.** *Royal Society of London, Proceedings, Ser. A*, 253(1275):451–462, Dec. 29, **1959.** 2 figs., table, 57 refs., 22 eqs. **DWB, DLC**—Consideration is given to the significance of recent rocket and satellite studies relating to the structure of the thermosphere. It is shown that unless hydrogen atoms are being captured very rapidly from interplanetary space they must be very

rare indeed at the base of the exosphere. Stress is laid on the importance of the steepness of the temperature gradient above the E layer in connection with the thermal economy. Though no final conclusion is reached, it is thought that the view that the ionizing radiation from the sun is the main source of heat is more attractive than any alternative view yet put forward. An analytic model of the thermosphere is described in the appendix. (*Same item as* 11J–15, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Thermosphere 2. Upper air temperature gradients 3. Satellite research 4. Rocket research.**—*Author's abstract.*

12E–132 551.501.7:551.507.362.1:551.510.536:551.510.3:551.557

Blamont, Jacques-Emile, **Nuages artificiels de sodium: vitesse du vent, turbulence et densité de la haute atmosphère.** [Artificial sodium clouds: wind speed, turbulence and density of the upper atmosphere.] *Académie des Sciences, Paris, Comptes Rendus,* 249(14):1248–1250, Oct. 5, **1959.** 3 figs., 3 refs. **DWB, DLC.** (Also in International Space Science Symposium, Nice, Jan. 1960, **Space Research: proceedings of the first Symposium,** pub. 1960. p. 199–202. 3 figs., 2 refs. French, English and Russian summaries p. 199.) **DWB** (523.1 161sp)—Two experiments for projecting sodium into the atmosphere by means of Véronique rockets have been made in Algeria. The first rocket reached an altitude of 127 km, the other 180 km. Author determines speed of wind and density by observing, through stereoscopic photogrammetry, the deformations of the cloud with time. Temperature and reactivity with sodium are determined through interferometric measurements. Successive photos show that the width of the trail increases with time, owing to the diffusion of the sodium atoms in the atmosphere. This diffusion occurs faster as atmospheric density is smaller. Investigating the width of the cloud helps determine the diffusion coefficient D of sodium and, consequently, the density. The principle of these experiments is clearly stated. (*Same item as* 11I–146, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmospheric density measurement 2. Upper air wind measurements 3. Artificial sodium clouds 4. Rockets.**—*A.V.*

12E–133 551.510.535:551.524.7

†Bogess, R. L., **Electrostatic probe measurements of the ionosphere.** Michigan Univ. [Engineering] Research Institute, Contract AF 19(604)-1843, Scientific Report No. GS-1 (report printed under Contract AF 19(604)-6124), Nov. **1959.** 135 p. 75 figs., 2 tables, 27 refs., 53 eqs. **DWB** (M(051) M624sci)—A Langmuir probe that measured the properties of the E layer of the ionosphere shows that the electron temperature and temperature gradient are greater than expected. Typical values such as 1980°K at 153 km, were observed. The first measurement of electron temperatures in this high altitude ranged between 112 km to 177 km. The report outlines the history of the investigation, dating back to 1901, the progress made thereafter in the theoretical and instrumental development. Discussions cover transmitted data, directly measured data, direct-channel high-sensitivity calibration, experimental probe volt-ampere characteristics, electron temperature data, reduction and the accuracy of the data reduction. Details on the electrostatic ionosphere probe experiments and of the instrumentation are given. (*Same item as* 11.12–355, Dec. 1960, *Met. Abs.*) *Subject Headings:* **1. Langmuir probe technique 2. E layer 3. Ionospheric temperatures.**—*N.N.*

12E–134 551.510.3:551.507.362

†Champion, K. W. (*Physics Dept., Tufts Univ.*) and Minzner, R. A. (*Geophysics Corp., Boston*), **Atmospheric densities from satellites and rocket observation.** *Planetary and Space Science,* N. Y., 1(4):259–264, Sept. **1959.** 2 figs., 21 refs. **DWB, DLC**—Atmospheric densities deduced from high altitude rocket flights have a large variability of which a large percentage is undoubtedly due to measurement errors. Prior to the IGY, the available density data gave reasonable support to the ARDC Model Atmosphere. Satellite data which at first appeared to be inconsistent with rocket data are now seen to be continuous with the average of presently available rocket derived densities. The current data suggest the revision of the 1956 ARDC Model to lower densities near 100 km altitude and demand higher densities above 160 km (a twenty fold increase at 500 km). The revised altitude distribution of density implies (1) lower temperatures at 90 km and (2) temperature-altitude gradients between 105 and 160 km (two times the molecular-scale-temperature gradient of the 1956 ARDC Model). Density-altitude and temperature-altitude profiles for a revised model atmosphere are discussed. (*Same item as* 11I–147, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Atmosphere density measurement 2. Rocket observations 3. Satellite observations.**—*Authors' abstract.*

12E–135 551.510.536:551.501.81:523.58

Fialko, E. I., **Novyĭ metod izmereniia vysoty odnorodnoĭ atmosfery.** [New method of measuring the height of a homogeneous atmosphere.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.,* No. 12:1891–1894, Dec. **1959.** fig., 5 refs., 9 eqs. **DWB, DLC**—The author examines the possibility of measuring the height of a homogeneous atmosphere in the meteor zone $H(h)$ by using the relationship $h_m(v)$ where h_m-characteristic height that differs slightly from the mean height h of the meteors and $h(v)$-mean height of the meteors grouped according to their velocities. The dependence of the

characteristic height of meteors $h_m(h_{\min})$ upon the parameters of a meteor and radar is examined and an equation expressing the increase in the manner of distribution of the altitudes Δh_m resulting from the transition from v, x, $m_{\min 2}$ is derived, namely

$$\Delta h_m(m_{\min}) \approx 2 \cdot H \cdot \ln \frac{v_2}{v_1} + H \ln \frac{\operatorname{cor} X_1}{\operatorname{cor} X_2} + \frac{H}{3} \ln \frac{m_{\min 1}}{m_{\min 2}}.$$

Where $B = h_0 + H(\ln p_0/Q) = p_0$ = pressure at height h_0 (h_0 = within the limits of the meteor zone), H = height of homogeneous atmosphere corresponding to h_m; Q = coefficient depending upon the parameter characterizing the physical and geometrical properties of the meteor; X = zenith distance of the meteor; m = mass of the meteor. The methods for measuring the height of a homogeneous atmosphere are developed and the relevant equations are presented. Here are

$$H \approx \frac{\Delta h_m}{2 \ln v_2/v_1}, \qquad H \approx \frac{\Delta h_m}{2.33 \ln v_2/v_1}$$

$$H \approx \frac{\Delta h_m}{\ln \dfrac{\operatorname{cor} X_1}{\operatorname{cor} X_2}} \quad \text{and} \quad H \approx 3 \frac{\Delta h_m}{\ln \dfrac{m_{\min 1}}{m_{\min 2}}}.$$

Quantitative measurements are presented. The determination of the mean altitude of the homogeneous atmosphere in the meteor zone is illustrated. *Subject Headings:* **1. Height of the atmosphere 2. Homogeneous atmosphere 3. Radar echoes from meteors.**—*I.L.D.* Ⓢ

12E–136 551.507.362.2:551.510.3:551.510.53

Groves, G. V. (*Dept. of Physics, Univ. College, London*), **Determination of upper-atmosphere air-density profile from satellite observations.** *Royal Society of London, Proceedings, Ser. A*, 252(1268):28–34, Aug. 25, **1959.** 2 figs., 4 refs., 64 eqs. **DWB, DLC**—The theory previously developed for the changes in the perigee distance and semimajor axis of a satellite orbit due to air drag is extended to enable the air density profile (i.e., its relative variation with height) to be derived from the motion of the orbit's perigee. The solution is first obtained in terms of the change in perigee distance and then in terms of the change in the radius of the earth at the sub-perigee point. Data are analyzed by the two methods, leading to 39(±9) and 36(±15) km for the scale height in the 180 and 220 km altitude regions. (*Same item as* 11.5–165 and 11J–63, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere density measurement techniques 2. Satellite density measurements.** —*Author's abstract.*

12E–137 551.510.53:551.507.362.1:551.510.3:551.547(712.7)

Horowitz, R.; LaGow, H. E. and Giuliani, J. F. (*all, Natl. Aeronautics and Space Admin., Wash., D. C.*), **Fall-day auroral-zone atmospheric structure measurements from 100 to 188 km.** *Journal of Geophysical Research*, Wash., D. C., 64(12):2287–2295, Dec. **1959.** 7 figs., table, 8 refs., 2 eqs. **DLC**—The density and pressure of the atmosphere from 100 to 188 km above Fort Churchill, Manitoba, Ca. were determined from the IGY NN 3.15 Aerobee-Hi rocket flight on Oct. 31, 1958, at 2:00 C.S.T. Two magnetic cold-cathode ionization gages were used to measure pressure and pressure changes on the side of the rolling rocket. Excellent agreement was obtained (a) between the two gages throughout flight, and (b) between ascent and descent measurements. Measured pressures in the region from 100 to 112.5 km were corrected for a residual gas pressure of approximately 3×10^{-5} mm Hg. An ambient pressure of 10^{-4} mm Hg was obtained at 106 km. The derived pressure of 2.3×10^{-6} mm Hg at 188 km is approximately a factor of 2 lower than the corresponding Arctic summer-day value. Densities were measured from 130 to 188 km. The density value of 5.2×10^{-7} g/m^3 at 188 km is approximately 40% lower than the summer-day value. The density profile presented here is in good agreement with the Arctic November-day density point obtained at 200 km in 1956. Scale heights (RT/Mg) were derived from the measured pressure and density data vs. altitude, using the hydrostatic equation. The scale-height value obtained at 188 km was 63 km, and the scale-height gradient from 180 to 188 km was 0.5 km/km. (*Same item as* 11I–153, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere structure 2. Aerobee-Hi rocket observations 3. Auroral zone atmospheric structure 4. Fort Churchill, Canada.**—*Authors' abstract.* Ⓢ

12E–138 551.507.362.1:551.510.3:551.524.7:551.510.53

Jastrow, Robert (*NASA Goddard Space Flight Center, Greenbelt, Md.*), **Density and temperature of upper atmosphere.** *Astronautics*, N. Y., 4(7):24–25, 108–109, July **1959.** figs., port. (incl. vita). **DLC**—The International Geophysical Year greatly contributed to the density and temperature research of the upper atmosphere. The use of rockets has increased our knowledge of upper atmosphere dynamics. There is evidence that the upper atmosphere in the auroral zone is controlled

by the intensity of the particles in the outer Van Allen belt. Measurements indicate that at 200 km the summer daytime density at Arctic latitudes is 6 times greater than at temperate latitudes. The analysis shows that densities in the auroral zone are controlled by the Van Allen belt and outside the auroral zone are independent of the latitude. *Subject Headings:* **1. Rocket exploration of the upper atmosphere 2. Upper atmosphere density data 3. Upper air temperature data.**—*A.H.K.* Ⓢ

12E–139 551.501.7:551.510.53:523.58

Katasev, L. A. (*Inst. Geophys. AN SSSR*, **The determination of the height of the homogeneous atmosphere from photographic observations of meteors.** *Soviet Astronomy AJ*, New York, 3(2):326–331, March/April **1959.** 3 figs., table, 14 refs., 20 eqs. **DLC.** Transl. of original Russian, **Opredelenie vysoty odnorodnoĭ atmosfery po fotograficheskim nabliudeniiam meteorov,** *Astronomicheskiĭ Zhurnal*, Moscow, 36(2):334–339, March/April **1959. DLC**—A formula is deduced for calculating the height of a homogeneous atmosphere from photographic observations of meteors. Results of the reduction of photographs of meteors are given. The temperatures in the zone 73–103 km, derived from the height of a homogeneous atmosphere, are compared with the results of other authors. *Subject Headings:* **1. Meteor photography 2. Height of the atmosphere 3. Homogeneous atmosphere.**—*Author's abstract.* Ⓢ

12E–140 551.510.3:551.510.53:551.507.362.2

King-Hale, D. G. and Walker, D. M. C. (*both, Royal Aircraft Estab., Farnborough, Hants*), **Irregularities in the density of the upper atmosphere: results from satellites.** *Nature*, London, 183(4660):527–529, Feb. 21, **1959.** 2 figs., 10 refs. **DLC**—Irregularities in air density, especially at heights between 180 and 225 km, tend to recur at intervals of about 28 days and there is reason to believe that this periodicity is related to solar disturbances. Results from satellites, Sputniks 1, 2, and 3, Explorer 1, 3, and 4 and Vanguard 1 are discussed and graphically represented in support of this hypothesis. (*Same item as* 11J–89, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere density variations 2. Satellite density measurements 3. Solar effects on upper atmosphere density 4. Soviet satellites 5. U. S. satellites.**—*I.S.*

12E–141 521.7:551.510.3:551.524.7

Kovalevsky, Jean (*Obs. of Paris*), **Le météore du 17 novembre 1955.** [The meteor of Nov. 17, 1955.] *L'Astronomie*, Paris, 73(5):195–203, May **1959.** 7 figs. **DLC**—Description of the meteor of Nov. 17, 1955, which was observed under five successive aspects. Analysis of nearly 6000 observations made it possible to describe the 5 phases of the phenomenon. Author investigates the trajectory of the bolide in the atmosphere and determines the following elements: vertical plane of the trajectory, ground-plane of the vanishing point, altitude of this position, tangent to the trajectory at this point, approximate shape of the trajectory in its plane and speed of the fire ball (nearly 30 km/s). Author determines also the elements of the orbit of the bolide. A diagram shows the relationships between the various aspects presented by the bolide and the temperature and density conditions of the atmospheric layers crossed. (*Same item as* 11.4–103, April 1960, *Met. Abs.*) *Subject Headings:* **1. Meteor, Nov. 17, 1955 2. Meteor trajectories 3. Upper air temperatures 4. Upper atmosphere densities 5. Meteor air density determination 6. Bolides.**—*A.V.*

12E–142 551.510.3:551.507.362.2

Krasovskiĭ, V. I. (*Academy of Sciences U.S.S.R., Moscow*), **Energy sources of the upper atmosphere.** *Planetary and Space Science*, N. Y., London, 1(1):14–19, Jan. **1959.** 18 refs. **DLC**—Investigations by earth satellites indicate that the product of atmospheric density and the square root of scale height at the 220–230 km altitude is higher in daytime than at night and also higher in polar regions than in equatorial ones. Interpretation of this data indicates that density and temperature in this region are much higher than previously supposed. Various energy sources which may account for this variable heating and swelling of the atmosphere are considered. An explanation is given in terms of variable heating due to electric currents in the upper atmosphere induced by magnetic fields frozen in the corpuscular streams. It is supposed that this mechanism can accelerate atmospheric ions and electrons. *Subject Headings:* **1. Satellite density measurements 2. Satellite temperature calculations 3. Electric currents in upper atmosphere.**—*Author's abstract.* Ⓢ

12E–143 551.594.51:535.33

Muliarchik, T. M., **Interferometricheskie izmereniia shiriny linii λ5577 A (OI) v poliarnykh siianiiakh.** [Interferometer measurement of the width of the λ5577 Å (OI) line in auroras.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 12:1902–1903, Dec. **1959.** fig., 7 refs. **DWB, DLC**—The forbidden line of λ5577 Å (OI) in auroras where width is determined entirely by the Doppler effect serves as a means for studying the kinematic temperature at the level of illumination. Observations were carried out on this line during 1958–1959 at lat. 64°, long. 127° by means of an interferometer with glass plates having a multilayer dielectric cover. Intermediate rings of molten

quartz of 6.8 and 10 mm thick were used. Interference rings of line λ5570 Å KrI from a Krypt gas charge tube were imprinted several times during the exposure upon the same frame as λ5577 A typical photograph of line λ5577 Å (OI) is presented and analyzed. It is concluded that t temperature measured on the photograph of the λ5577 Å emission of an undisturbed night s amounts to 260±35°K. This value exceeds the measurement of WORK and ARMSTRONG. It possible that the difference is produced by the warming up of the upper atmosphere in high geograp latitudes. Such warming was observed also on the basis of measurements of the rotating temperatu zone of OH. (*Same item as* 11.10–180, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Forbidden [C lines 2. Auroral emissions 3. Auroral temperatures.**—*I.L.D.*

12E–144 551.510.536:551.594.13 551.507.362.2:551.506.

Nicolet, M., **Nouvelles de l'espace.** [Space news.] *Ciel et Terre*, Brussels, 75(3/4):91–10 March/April **1959.** 4 figs. **DLC**—Account of the results obtained by means of artificial satelli during the International Geophysical Year as concerns high atmosphere. First of all, author d cusses dissociation and recombination of oxygen and nitrogen molecules in upper atmosphere, wh motions of charged particles are bound to the earth's magnetic field. A table shows the m peculiarities of the satellites launched up to March 1959. Diminution of satellite's orbit, owing decrease of speed caused by atmospheric density, is discussed. The proportion of change in satellit orbit shows that the irregularities in density of air result principally from fluctuations in solar rad tion. Data relating to the changes in density within thermosphere and influence of the rise temperature upon the increase in density are given. Densities observed and their fluctuations sh that the thermal gradient at 150 km is >10° per km and may reach values such as 30° and 40° per k Results obtained by means of satellites and whistlers show that ionization decreases very slow with altitude beyond the maximum, in the range of 10^6 electrons per cm^3, of the F2 region. Th show that there is no propagation about the equator and that the phenomenon follows the lines force going from one hemisphere to the other. Comments on the artificial geomagnetic and rad electric effects caused through thermonuclear explosions, and more particularly on the artific creation of temporary radiation zones at altitudes of 10,000 km or so are included. (*Same item* 11.4–150 and 11J–122, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere 2. Atmospheric dens 3. Dissociation and recombination of oxygen and nitrogen molecules 4. Ionization 5. Satelli observations 6. International Geophysical Year, 1957–1958.**—*A.V.*

12E–145 551.501.724:551.524.7:535.

Prokudina, V. S., **Opredelenie vrashchatel'noĭ temperatury gidroksila v verkhneĭ atmosfe** [Determination of the "rotational" temperature of hydroxyl in the upper atmosphere.] *Akadem Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 4:629–631, April **1959.** 3 figs., 3 tables, 4 refs. **DL** Transl. into English in the corresponding number its *Bulletin of the Academy of Sciences, USS Geophysics Series.*—The method of determining the temperature from the spectrum of OH is bas on the assumption that the distribution of intensities in the branches of the rotating field is associat

with the temperature of disturbance by the relationship $I_{em} = \text{const}\ i(J')e^{-\frac{W}{kT}}$ where I_{em} = intensi of rotating lines in relative units; W = energy of disturbance (in the given case the rotating ener of the initial level); $W = B_u'J'(J'+1)$; J' = rotating quantum number of the upper initial sta T = temperature of disturbance; $i(J')$ = intensity factor; k = Boltzmann constant. The temperatu of disturbance was determined by $T = \frac{Bv'}{k}\frac{1}{tg\varphi}$ °K, where φ = angle between $\ln\frac{I_{1m}}{i(J')} = \frac{Bv'}{kT} \times J'(J'+$ and the axis of the abscissa. The intensity fields are determined by $i(J') = \frac{(J'+1+\Omega)(J'+1-}{(J'+1)}$ where J' = rotating quantum of the upper state and Ω = projection of the complete electronic mome upon the internuclear axis. The temperature determined for intense branches is presented in grapl and temperatures for different days are presented in a table. The mean rotating temperature f the zone (9.3) is $T = 240 \pm 20$°K. (*Same item as* 11.9–278, Sept. 1960, *Met. Abs.*) *Subject Heading* **1. Upper air temperature measurement techniques 2. Hydroxy (OH) spectra 3. Rotation temperatures.**—*I.L.D.*

12E–146 551.507.362.2:551.510.536:551.510

Reed, Jack W. (*Sandia Corp.*), **A note on satellite density observations.** *American Meteor logical Society, Bulletin*, Boston, 40(6):310–311, June **1959.** 2 figs., 5 refs. **DWB, DLC**—Calcul tions of atmospheric density at 250 mi height, based on Minitrack observations of Sputnik I, sh density to be 40 times as high as previous estimates indicated. This is held to be an error, attribu able in part to assumption of too low temperatures in the ozonosphere layer. The paper furth illustrates this point by discussing the instances of acoustic observations reported at Americ Meteorological Society national meetings in 1954 and 1956. Atmospheric temperature and altitu

odels are graphically represented. (*Same item as* 11J-139, Oct. 1960, *Met. Abs.*) *Subject Headings:* **Upper atmosphere density observations 2. Soviet satellite, 1957 Alpha (Sputnik I).**—*I.S.*

12E-147 551.510.5:551.507.362

†Repnev, A. I., **Svoĭstva verkhneĭ atmosfery i iskusstvennye sputnik zemli.** [Properties of the pper atmosphere and artificial earth satellites.] *Moscow. Tsentral'naia Aerologicheskaia Obrvatoriia, Trudy*, No. 25:5–62, **1959.** 6 figs., 12 tables, 137 refs., 57 eqs. **DLC**—Described as the st comprehensive Russian language report on the upper atmosphere based on data from satellites, is survey article actually covers both satellite and rocket research. The author's manuscript went press in the second half of 1958 and includes observational results from the first six Soviet and merican satellites (through 1958-Delta launched May 15, 1958); but rocket results are largely ose obtained from rockets fired before 1957, although *IGY Rocket Report* No. 1, which covers ckets fired through early 1958, is cited among the literature references. The U.S.S.R. rocket ta presented here are principally those published by ALEKSEEK and MIKHNEVICH in 1957. The pics discussed in the section on rocket results include the following: atmospheric temperature, essure and density, molecular state, the earth's magnetic field, wind and general circulation models, rbulence, molecular diffusion, and photodissociation. The section on satellites begins with a ysical description of the satellites launched to May 1958 and a listing of the experiments involved each launching. This is followed by a brief exposition of the scientific uses of earth satellites, cluding a list of 19 categories of potentially derivable information, and extended discussions, with servational results obtained thus far, for a number of special topics, including the determination of essure and density, geodesic measurements, meteors and interplanetary matter, the measurement the intensity of Lyman α radiation, the ionosphere (ion composition, electron density, etc.) the rth's magnetic field, cosmic ray research, the general theory of relativity, and others. (*Same item* 11I 176, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere properties 2. Satellite ta 3. Rocket data.**—*R. S. Quiroz.*

12E-148 551.510.3:551.524.7:551.510.53:551.507.362.2

†Schilling, G. F. and Sterne, T. E. (*both, Smithsonian Astrophysical and Harvard Col. Obs.*), **nsities and temperatures of the upper atmosphere inferred from satellite observations.** *Journal Geophysical Research*, Wash., D. C., 64(1):1–4, **1959.** fig., 2 tables, 21 refs. **DLC**—Surface servations of artificial Earth satellites permit the inference of upper atmosphere densities from anges in the orbital elements caused by drag. The atmospheric density between some 180 km 400 km alt. appears to be appreciably higher, on the average, than was usually thought before tellite data became available. In order to be consistent with the observed phenomena, the atospheric temperature at or below these altitudes must also be higher than that given by a number model atmospheres. (*Same item as* 11J-141, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Satellite nsity measurements 2. Upper atmosphere densities 3. Upper air temperatures.**—*Authors' stract.*

12E-149 551.510.3:551.510.53:551.507.362.2

*†Schilling, G. F. and Whitney, C. A. (*both, Smithsonian Astrophysical and Harvard College Obs., ass.*), **Derivation and analysis of atmospheric density from observations of Satellite 1958 Epsilon.** *anetary and Space Science*, N. Y., 1(2):136–145, April **1959.** 2 figs., 5 tables, 25 refs., eq. **DWB.** so issued as **Atmospheric densities from Explorer IV.** *Smithsonian Institution, Astrophysical servatory, Special Report*, No. 18:13–22, Oct. 4, **1958.** fig., 5 tables, 18 refs. **DWB.** Reprinted in *ternational Geophysical Year*, 1957/1958. *IGY World Data Center A (for) Rockets and Satellites, Y Satellite Report Series*, No. 8:93–102, June 15, **1959.**—The orbital behavior of Satellite 1958 silon has been analyzed to derive average upper atmosphere densities in the altitude interval of 7 km to 270 km between lat. 50°N and 50°S. The method of computation and possible errors in calculations are discussed in detail. At an altitude of 262.5 km above intermediate northern itudes, the most probable value of mean density was found to be $1.3 \pm 0.4 \times 10^{-13}$ g/cm^3. All merical results showed a high degree of internal consistency, but gave no evidence of any appreci-le variation of average density between latitudes 49°N and S during the time interval July to vember 1958. The data did not warrant firm interpretation of small deviations which could be ribed to either a day-night effect or slightly higher mean densities in the Northern Hemisphere. about 50°N and S latitude, however, a sharp discontinuity was found, with the average density lue in the Northern Hemisphere about twice that in the Southern Hemisphere. Assuming this be a real phenomenon, the authors present tentative conclusions about the physical and dynamical te of the upper atmosphere. In addition, an explanation is offered for some of the apparent crepancies between mean density values obtained from satellite observations and many of the asurements by means of high altitude research rockets. (*Same item as* 11J-142, Oct. 1960, *t. Abs.*) *Subject Headings:* **1. Satellite air density measurement techniques 2. Upper atmosphere nsity data 3. U. S. satellite, 1958 Epsilon (Explorer IV).**—*Authors' abstract.*

12E–150 551.510.53:551.507

U. S. Air Weather Service. Climatic Center, **Survey of availability of atmospheric data at 100,000 feet from U. S. rocketsonde and satellite observations.** Washington, D. C., Aug. 1 [35] p. Mimeo.—Answers to questionnaires sent to 24 civilian and military agencies in the U regarding availability and type of upper atmosphere data from rockets and satellites up to 1959 are tabulated in great detail. Tabulations include replies to 30 questionnaires. Several r were excluded for security or other reasons (several agencies had more than one questionnair operation). The elements considered were wind, direction and speed; air density, temperat pressure, turbulence, ion density, meteorite impacts; nightglow, ozone, magnetic, auroral, cl radiation, electrical and other measurements. (*Same item as* 11.5-167, May 1960, *Met. A Subject Heading:* **1. Rocket and satellite data availability.**—*M.R.*

12E–151 551.507.362.2:621.396.8:551.510

Vassy, E., **L'émission radioélectrique des Satellites artificiels: applications à la connaissa de l'ionosphère.** [Radio transmission from artificial satellites: applications on the knowledge of ionosphere.] *L'Onde Electrique,* Paris, 39(388/389):647–653, July/Aug. **1959.** 8 figs., ta French and English summaries. **DLC**—The radio features of the Soviet and U. S. artificial satel are summarized. A description is then given of investigations of the properties of the upper mosphere based on the simple reception of a transmitted radio signal without knowledge of the c A report is made of the methods to determine the air density of the upper atmosphere, using Doppler-Fizeau effect, radio interferometry, the Faraday effect and refractive waves. The aut comments on these various methods and shows their great utility. (*Same item as* 11.5–166 11J 182, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere density measurement techniq 2. Radio transmissions 3. Doppler-Fizeau effect 4. Faraday effects 5. Radio interferom techniques.**—*A.V. and author's abstract.*

12E–152 551.594.51:535.33:546.

Wallace, L. and Chamberlain, J. W. (*both, Yerkes Obs., Univ. of Chicago, Williams Bay, Wi* **Excitation of O_2 atmospheric bands in the aurora.** *Planetary and Space Science,* N. Y., 2(1):60 Oct. **1959.** 3 figs., 2 tables, 26 refs., 13 eqs. **DWB**—Spectra of the aurora show a wide dispa between the rotational temperatures of the two observed atmospheric bands $b'\Sigma g^+ \rightarrow x^3\Sigma g^-$, v $T_{rot}(0-1) \approx 200°K$ and $T_{rot}(1-1) > 700°K$. As the rotational structure of the bands is not resol it is not absolutely certain that the temperature anomaly is real, but known features in the aurc spectrum would not produce the effect through blending. Fluorescence in the 0–0 band provi a possible but improbable explanation. Another alternative to explain the data is excitation of by energy transfer from $O(^1D)$ (upper term of the red lines) followed by vibrational deactivati In the latter case the relative intensities of the O_2 bands from vibrational levels $V' \geq 1$, and prec virtually complete suppression of the (OI) red lines at 100 km in the airglow. The airglow emission gives $T_{rot}(0-1) = 183°K$. (*Same item as* 11.10–187, Oct. 1960, *Met. Abs.*) *Subj Headings:* **1. Auroral temperatures 2. Oxygen bands 3. Airglow spectrum theories.**—*Authe abstract.*

12E–153 551.501.81:523

Weiss, A. A. (*Dept. of Physics, Univ. of Adelaide*), **Theory of the radio-echo meteor hei distribution in a non-isothermal atmosphere.** *Australian Journal of Physics,* Melbourne, 12(1):5 64, March **1959.** 5 figs., 9 refs., 21 eqs. **DLC**—The theory of the distribution in height of echoing points of shower meteors and of sporadic meteors belonging to a homogeneous veloc group, is extended to the case of a model atmosphere in which the scale height is a linear function height. The mean and the r.m.s. deviation from the mean of the height distribution in this mosphere are obtained in terms of tabulated functions, and the dependence of these paramet upon the scale height gradient is evaluated. Neither parameter varies strongly with the sc height gradient unless the incident meteors include a large proportion of massive particles. Expe mental cut-off and the approximations made in the formation of the theory limit the accuracy w which atmospheric scale height and density can be determined from observed heights of spora meteors. (*Same item as* 11.8–68, Aug. 1960, *Met. Abs.*) *Subject Headings:* **1. Radio echoes fr meteor showers 2. Meteor observation of atmospheric density.**—*Author's abstract.*

1960

12E–154 551.510.535:551.594

Bauer, Siegfried J. (*Fort Monmouth, N. J.*), **Inferred temperature variations at the F2 pea** *Journal of Geophysical Research,* Wash., D. C., 65(6):1685–1690, June **1960.** 6 figs., table, 9 ref eqs. **DLC**—Information on the ionospheric electron content deduced from the Faraday rotation lunar radio reflections and ionospheric data obtained by vertical-incidence soundings are used infer scale heights at the F2 peak. The scale height is found to exhibit pronounced time variatio

at are interpreted as variations in the temperature at the F2 peak. The average values of inferred le heights at the F2 peak are compared with scale heights of a model atmosphere based on recent cket and satellite data and are found to lie within ±15% of the model values. One exception to is finding occurred on a day following a magnetic storm: on this day, the scale height was more than % higher than the model value. This difference suggests the possibility of a pronounced increase ionospheric heating at such times. *Subject Headings:* **1. Ionospheric electron density calculation Ionospheric temperatures.**—*Author's abstract.* Ⓢ

12E–155 551.510.535:551.506.22

Beynon, W. J. G. (*University College of Wales, Aberystwyth*), **Ionospheric results during the Y.** *Times Science Review*, London, No. 38:8–9, **1960.** 4 figs.—A brief outline is given of the ain structure of the ionosphere and methods used to study it. The IGY program was planned ing priority to the extension of the existing network of vertical sounding stations in particular in polar and equatorial regions. Particular phenomena studied intensively during the IGY were F2 region equatorial anomaly, the equatorial electro-jet, the polar black-outs, the polar sporadic- ionization and the composition of the "top-side" of the ionosphere. The development of the hniques of studying these phenomena and the extent of the discoveries made are discussed. *bject Headings:* **1. IGY ionosphere program 2. Ionospheric structure 3. Polar blackout.**—*R.B.* Ⓢ

12E–156 551.507.362.2:551.510.53:551.510.3

Bochniček, Z. V. (*Bratislava, Czechoslovakia*), **Profile of upper atmosphere air density at the ght 180–212 km derived from the orbit of Sputnik III.** *Nature*, London, 186(4723):460–461, y 7, **1960.** 2 figs., 2 refs., 3 eqs. **DWB**—Air density can be determined from observed changes size and shape of the satellite orbit when the drag coefficient of the satellite is known. To get profile of upper atmosphere air density at a height of 180–212 km, the orbital elements and their nges for the third Soviet satellite, $1958\delta_2$, were analyzed during the time-interval March 11, 1959 Jan. 5, 1960. The result of the analysis is shown in figs. It is noticeable that the scale height s 2–3 times greater than that observed from various theoretical models of the upper atmosphere l that no seasonal effect was detectable during the observation period although other artificial ellites with higher perigees were strongly influenced by changes of air density of long duration. *me item as* 11J 18, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere densities Soviet satellite, 1958 Delta (Sputnik III).**—*E.K.*

12E–157 551.524.7:551.510.535:621.396.8

Dowden, R. L. (*Ionospheric Prediction Service, Hobart, Tasmania*), **Ionospheric thermal radiation radio-frequencies in the auroral zone.** *Journal of Atmospheric and Terrestrial Physics*, London, 1):8–19, April **1960.** 6 figs., 2 tables, 11 refs. **DLC**—Measurements of the temperature of the ospheric D-region in the auroral zone from observations of 2 Mc/s radio noise are described and pared with measurements similarly made in the temperature region. The temperatures of the listurbed and disturbed ionospheres at the two latitudes are found to be essentially similar, but disturbing influence in the auroral zone is probably corpuscular rather than ultra-violet radiation. *me item as* 11.10–324, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Ionospheric temperatures D region 3. Radio noise from ionosphere.**—*Author's abstract.*

12E–158 551.501.724:551.501.75:551.596.1

Ecolian, Jean; Hieblot, James and Rocard, Yves, **Contribution à l'étude des zones de silence ore et à la focalisation lointaine du son.** [Contribution to the study of sound silence zones and distant focalization of sound.] *Académie des Sciences, Paris, Comptes Rendus*, 250(22):3605–7, May 30, **1960.** 2 figs. **DWB, DLC**—Experiments with sound focalization undertaken in the ara at a range of about 200 km gave evidence of signals reflected at a height equivalent to about km. A short survey of the equipment and of the observation method is given. These experi- nts seem to prove that a true focalization with sound concentration should exist at about 215 km. temperate countries, a third sound-listening zone is often observed at about 500 km. This zone be explained by a sound reflection on the ground towards 200–250 km starting again at an tude of 50 km to be once more directed down to the ground. These results show again that the action of sound trajectories towards the ground is due to the gradient and to the distribution of peratures and winds aloft. These facts and results evoke the possibility of extending up to km altitude, by this method, the study of temperatures and winds in the atmosphere. *Subject dings:* **1. Acoustical propagation 2. Silence zone 3. Acoustical upper wind measurements Acoustical temperature determination.**—*A.V.* Ⓢ

12E–159 551.510.3:551.510.53:551.507.362.2

El'iasberg, P. E. and Iastrebov, V. D., **Opredelenie plotnosti verkhneĭ atmosfery po rezul'tatam liudeniĭ za poletom tret'ego sovetskogo iskusstvennogo sputnika Zemli.** [Determination of the sity of the upper atmosphere according to flight observations of the third Soviet artificial earth

satellite.] *Iskusstvennye Sputniki Zemli*, Moscow, No. 4:18–30, **1960.** fig., 6 tables, 4 refs., 26 **DLC**—Observations of satellite orbits provide one of the most reliable means of determining u atmospheric density values. In this paper such values are derived from the most accurate meas ments of orbital elements of the third Soviet artificial satellite. The method of calculation is scribed in detail and numerical values of the calculated elements are tabulated. The atmosph density obtained for height of 246 km is 1.72×10^{-13} g/cm^3 for Sputnik orbits. This compares 1.73×10^{-13} g/cm^3 and 1.40×10^{-13} g/cm^3 as obtained with Sputnik II and Sputnik I with ca rocket, respectively. (*Same item as* 11J–39, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. U atmosphere density measurements 2. Satellite data 3. Soviet satellite, 1958 Delta (Sputnik —*G.T.*

12E–160 551.510.3:551.510.53:5

†Greenhow, J. S. and Lovell, A. C. B., **The upper atmosphere and meteors.** (In: Ratcliffe, J (*ed.*), *Physics of the upper atmosphere.* N. Y., Academic Press, **1960.** p. 513 549. 22 figs., 4 tal 55 refs., eqs.) **DWB** (M10.5r233ph)—This chapter is concerned with the interaction of met with the upper atmosphere, particularly with the information which may be obtained about conditions, densities, diffusion, and the processes which govern the evaporation techniques of meas ment with regard to interaction of meteors with the upper atmosphere are discussed. The va tions of upper atmospheric density with height are presented up to 110 km determined by var techniques. Numerous photographs and graphs nicely illustrate the chapter. *Subject Headi* **1. Upper atmosphere densities from meteors 2. Meteor research.**—*I.S.* Ⓢ

12E–161 551.501.71:551.510.3:551.51

Greenhow, J. S. and Hall, J. E. (*both, Univ. Manchester*), **Diurnal variations of density and s height in the upper atmosphere.** *Journal of Atmospheric and Terrestrial Physics*, London, 18(2 203–214, June **1960.** 9 figs., table, 14 refs., 8 eqs. **DLC**—The radio-echo meteor technique been used to investigate atmospheric density and scale-height variations between altitudes o and 105 km. A diurnal oscillation of density with an amplitude equal to 13% of the mean den at 96 km is found. The amplitude of this oscillation increases by a factor of 3 over the obser height range. A semi-diurnal density variation approximately half the diurnal oscillation is present. *Subject Headings:* **1. Upper atmosphere density measurement techniques 2. Diu upper atmosphere density variations.**—*Authors' abstract.* Ⓢ

12E–162 551.510.5:551.50

†*International Geophysical Year, 1957/1960. IGY World Data Center A, National Academ Sciences, Wash., D. C., **Seventh six-monthly catalogue of data in IGY World Data Center A.** *IGY General Report* No. 13, Jan. **1961.** 229 p. 34 refs. plus references to published source data, and other pertinent literature. **DWB**—Data are divided into 11 disciplines: Airglow Ionosphere; Aurora (Instrumental); Aurora (Visual); Cosmic Rays; Geomagnetism, Gravity Seismology; Glaciology; Longitude and Latitude; Meteorology and Nuclear Radiation; Oc ography; Rockets and Satellites; and Solar Activity. The report presents a table showing location of IGY World Data Centers and a catalog of data received at these centers in the var disciplines listed above during the period 1 July 1957–31 Dec. 1960. The author and subject in of the chapter on **Rockets and Satellites** contains references to about 470 reports and reprints. report supersedes all previous six-monthly catalogs of the IGY World Data Center A. (For abstract on the fifth six-monthly catalog, *see* 11I–190, Sept. 1960, *Met. Abs.*) *Subject Headi* **1. Upper atmosphere research 2. IGY data centers.**—*E.K.* Ⓢ

12E–163 551.507.362.1:551.501.724:551.524.7(

Johnson, C. Y.; Hoffman, J. H.; Young, J. M. et al., **A method for measuring tempera directly in the upper atmosphere with a rocket-borne magnetic mass spectrometer.** *Journ Geophysical Research*, Wash., D. C., 65(9):2996–2997, Sept. **1960.** fig. **DLC**—An Aerobe rocket launched at the White Sands Missile Range, N. Mex. June 27, 1960 to determine the t perature of the atmosphere above 100 km by means of a rocket-borne mass spectrometer measu the flow through an entrance system of a specific atmospheric constituent, is described. Sig were recorded from 150 km to 220 km and down to 80 km on the descent. The mass spectrom determined the number of molecules passing through the entrance system, sorted molecules accor to mass, enabling temperature determination by an assumed velocity distribution providing for simultaneous temperature measurements in choosing molecular nitrogen and argon gases. The beam intensity modulation served as a function of the attitude and velocity of the entrance sys and the velocity distribution of the atmospheric molecules or their temperature. A diffusive sep tion measurement of the nitrogen and argon gases was possible also. Because of the cons pressure of about 104 mm Hg, caused probably by gas leak or surface outgassing, an accurate t perature profile will not be obtained from this first experiment. *Subject Headings:* **1. Upper**

temperature measurement techniques 2. Rocket data 3. White Sands, N. Mex. I. Homles, J. C.—*O.T.* Ⓢ

12E–164 551.510.535:551.524.7:551.547.5:551.557

Johnson, Francis S. (*Lockheed Missiles and Space Div., Palo Alto, Calif.*), **Pressure and temperature equalization at 200 km altitude.** *Journal of Geophysical Research*, Wash., D. C., 65(8):2227–2232, Aug. **1960.** 2 figs., 8 refs. **DLC**—Atmospheric pressure at 200 km must be nearly constant over the entire earth as a result of large scale air motions which can occur in the ionosphere. In the lower atmosphere, adjacent areas of high and low pressure can exist without annihilation by pressure equalization; direct air flow from high to low pressure does not occur, because balanced circulations developed in which inertial forces (centrifugal and Coriolis) balance the pressure forces and prevent equalization. At altitudes near 200 km, viscous forces prevent the balanced circulations from occurring, so pressure equalization can proceed rapidly. The heat transport associated with the air motion is large and tends to bring about temperature equalization also. At still higher altitudes, the heat content and the pressure forces are smaller but the viscous forces for a given velocity shear remain unchanged, making possible the existence of pronounced high-pressure areas in regions of local heating. The conclusion reached in this study does not permit one to accept the frequently held concept that the polar or auroral zone ionosphere is much warmer than the equatorial ionosphere with pressures at 200 km several times larger in the polar regions (e.g., at Churchill, Canada) than at temperate and low altitudes (e.g., at White Sands, N. Mex.). (*Same item as* 11.11–53, Nov. 1960, *Met. Abs.*) *Subject Headings:* **1. Ionospheric temperature equalization 2. Ionospheric movements 3. Pressure equalization.**—*Author's abstract.*

12E–165 551.510.3:551.510.53:551.507.362.2

Kolegov, G. A., **Variatsii plotnosti verkhneĭ atmosfery po dannym ob izmenenii periodov obrashcheniia iskusstvennykh sputnikov Zemli.** [Variations in the density of the upper atmosphere according to data on the changes of rotation periods of artificial earth satellites.] *Iskusstvennye Sputniki Zemli*, Moscow, No. 4:31–34, **1960.** 2 figs., 5 refs., eq. **DLC**—Observations of artificial satellite orbits have shown that their durations do not decrease monotonously in proportion to their descent into the atmosphere. From irregularities in the decrease of satellite orbit duration, atmospheric density variations can be inferred. In this paper a method of calculating such variations is described. Two curves showing daily variations of atmospheric density at 226 km as derived from observation of Sputniks 2 and 3 and carrier rockets of Sputniks 1 and 3 are presented. (*Same item as* 11J–94, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere density variations 2. Satellite density measurements 3. Soviet satellites.**—*G.T.*

12E–166 523.75:551.594.51

McPherson, D. H. (*Queen's Univ. of Belfast, Ireland*), and Jones, A. Vallance (*Univ. Saskatchewan, Canada*), **A study of the latitude dependence of OH rotational temperatures for Canadian stations.** *Journal of Atmospheric and Terrestrial Physics*, London, 17(4):302–308, Feb. **1960.** fig., 4 tables, 13 refs. **DLC**—Spectra of the 6,2 and 5,1 OH rotation-vibration bands have been obtained at Saskatoon, Churchill and Resolute Bay over the period of 1957–1958. Rotational temperatures have been derived from the spectra. The mean temperatures obtained at the stations were: Resolute Bay (Feb.-March, 1957) 296°K, Saskatoon (Feb.–March, 1957) 264°K, Churchill (March, 1958) 246°K, and Saskatoon (April–May, 1958) 227°K. The results were consistent with the latitude effect detected by CHAMBERLAIN and OLIVER (1953). There appears to be a significant but unexplained difference between the 1957 and 1958 Saskatoon results. (*Same item as* 11.9–131, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Rotational temperatures of auroras 2. Saskatoon, Saskatchewan.**—*Authors' abstract.*

12E–167 551.510.41:551.507.362.1(712.7)

Meadows, E. B. and Townsend, J. W., Jr. (*both, U. S. Naval Res. Lab., Wash., D. C.*), **IGY rocket measurements of Arctic atmospheric composition above 100 km.** *International Space Science Symposium, Nice, Jan. 1960, Space Research: proceedings of the First Symposium.* Pub. **1960.** p. 175–198. 16 figs., 16 refs., 2 eqs. Russian summary p. 175.) **DWB** (523.2 161sp)—As part of the U. S. IGY rocket sounding program the Naval Research Laboratory launched four Aerobee-Hi research rockets instrumented with radio-frequency mass spectrometers to study neutral gas composition above 100 km at Fort Churchill, Canada. Results from the flights, two at night and two during the daytime, show that diffusive separation in the arctic high atmosphere begins near 110 km and that the mean molecular weight of the atmospheric gases during arctic winter and spring is probably higher than previously believed. Data were also obtained on the variation of atmospheric density with altitude and on the distribution of ions as measured by the gas spectrometer over limited altitude intervals. Qualitative data were obtained on the presence of the light gases, hydrogen and helium. *Subject Headings:* **1. Atmospheric composition 2. Upper atmosphere density**

data 3. Rocket observations 4. IGY rocket program 5. Ft. Churchill, Canada.—*Author's abstract.* Ⓢ

12E–168 551.594.51:535.3

Muliarchik, T. M., **Interferometricheskoe izmerenie shirin emissiĭ λ6300 Å (OI) i λ5198–5200 Å (NI) v poliarnykh siianiiakh.** [Interferometer measurement of λ6300 Å (OI) and λ5198–5200 Å (NI) emissions from auroras.] *Akademiia Nauk SSSR, Doklady*, 130(2):303–306, 1960. 4 figs., 7 refs. **DLC**—In this interferometric measurement of the forbidden emission of aurora individual emissions were separated by filters with transmission bands of 80–100 Å. Quartz interference rings 8 and 10 mm in diameter were used to photograph the red oxygen line. The interferometer was placed in a hermetically sealed chamber and both were placed in a heat-insulated bo in which the temperature was maintained constant within ±0.5°C. Photographs of the interferenc rings of the λ6300 Å line (OI) and of the yellow krypton line and of the forbidden doublet of nitroge λ5198–5200 Å and a photometric section of the internal λ6300 Å ring are presented. The tem peratures determined from the width of the red line were between 1200 and 3400°K. The accurac of all cases was ±15%. The mean temperature of these photographs was 1210±50°K. A tendenc to increase in temperature with increase in illumination brightness was observed. In type A aurora there was a temperature of about 1500°K. When the intensity of line λ6300 Å was 2–5 kilo Rayleig and 1700–2000°K with an intensity 5–15 kilo Rayleigh, the ratio of the intensities of the double components 5198 5200 Å was $I_{5200}/I_{5198}=1.7\pm0.1$. The temperatures determined from the widt of 5200 Å were 1850±250°K for the first photograph and 2000±300°K for the second one. (*Same item as* 11.10–181, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Forbidden [OI] lines 2. Aurora emissions 3. Auroral temperatures.**—*I.L.D.*

12E–169 535.41:551.594.5:551.521.32

†Muliarchik, T. M., **Interferometricheskie izmereniia temperatury verkhneĭ atmosfery po shirin nekotorykh emissionnykh liniĭ.** [Interferometric temperature measurements of the upper at mosphere based on the width of some emission lines.] *Akademiia Nauk SSSR, Izvestiia, Ser Geofiz.*, No. 3:449–458, March **1960.** 5 figs., 25 refs. Russian summary p. 449. **DLC.** Trans into English in the corresponding number of its *Bulletin of the Academy of Sciences, USSR, Geo physics Ser.*—The results of measurements of the contours of several emission lines of the uppe atmosphere obtained by means of the interferometer are presented. The contents of this pape include the following: a discussion of the applicability of the interferometric method to the measure ment of the temperature of the upper atmosphere during illumination of the night sky, polar aurora and twilight flares; a review of the literature on interferometric measurement of the temperatur of the upper atmosphere; a description of the interferometer with the aid of a diagram and the metho of its operation; determination and values of the instrumental contours; and the results of measure ments of contour lines λ5577 Å (OI), 6300 Å (OI) and of line width λ5200 Å (NI) under condition of illumination of the night sky, polar auroras and twilight flares are presented. A comparison o the temperatures measured according to lines λ5577 and 6300 Å at different latitude indicates tha the upper atmosphere apparently experiences a heating at higher latitudes. *Subject Headings* **1. Interferometry of aurora and airglow 2. Upper atmosphere temperature measurement technique 3. Emission line temperatures.**—*I.L.D.*

12E–170 551.511:551.510.3:551.510.5

†Nicolet, M. (*Centre Nat'l. Recherches l'Espace, Uccle*), **Les variations de la densité et du transpor de chaleur par conduction dans l'atmosphère supérieure.** [Variations of the density and of the hea exchange by conduction in the upper atmosphere.] *International Space Science Symposium, Nice Jan. 1960, Space Research: proceedings of the First Symposium.* Pub. **1960.** p. 46–89. 14 figs. 3 tables, 67 refs. English and Russian summaries p. 46. **DWB** (523.1 161sp)—The density varia tions in the thermosphere, derived from satellite observations, show besides the effects of oblateness and those correlated with solar activity a clear difference between day and night. This difference and its increase with altitude corresponding to a rapid drop of the temperature after sunset follow from the fact that the atmosphere above 250 km is isothermal and that the main heating occurs by absorption of ultraviolet solar radiation below 200 km. The increase of scale height with altitude arises from the decrease of molecular weight in a diffusion atmosphere of O and N_2. The hea conduction is quantitatively discussed. The most important variation above 200 km is the diurna variation of the temperature of the isothermal layer. The periodic variation (28 days) associated with solar activity will lead to a great difference between sunspot maximum and minimum. The special heating associated with corpuscular radiation occurs during the time necessary for the re-distribution of a horizontal isothermy. Latitudinal and seasonal variations are less important since horizontal differences are rapidly leveled out because of the short times of conduction above 200 km *Subject Headings:* **1. Upper atmosphere density variations 2. Heat exchange 3. Thermosphere** —*Author's abstract.* Ⓢ

12E–171 531.52:551.501.75:551.510.3:551.510.53

Otterman, J.; Sattinger, I. J. and Smith, D. F., **Analysis of a falling-sphere experiment for measurement of upper-atmosphere density and wind velocity.** Michigan. Univ. Willow Run Labs., Ann Arbor, Michigan, Contract AF 19(604)-5205, [Report] 2873-5-F, April **1960.** 52 p. 16 figs., 8 tables, 18 refs., 50 eqs. **DWB** (M(051) M624an). Also in: *Journal of Geophysical Research*, Wash., D. C., 66(3):819–822, March **1961.** 14 refs., 9 eqs. **DLC**—A method is described by which upper air density and wind velocity can be determined by measuring the drag acceleration of a falling sphere by means of accelerometers mounted on an inertial platform carried within the sphere. An investigation was made to determine the size, weight, and accuracy of available inertial platforms. An analysis based on this information shows that air density and wind velocity can be measured by this method up to altitudes of at least 150 km and 120 km, respectively. The error in air density measurement would be 20% or less, and the wind velocity error would be 10 m/sec or less. Some of the major considerations in the design of the system are discussed, particularly those involved in the selection or design of the rocket, inflatable sphere, and inertial-platform system. *Subject Headings:* **1. Upper atmosphere density measurements 2. Upper air wind measurements 3. Falling sphere method.**—*Authors' abstract.* Ⓢ

12E–172 551.507.362.2:551.510.3:551.510.535.4

Priester, W. and Martin, H. A. (*both, Sternwarte der Universität, Bonn*), **Temperature inversion in the F1-layer.** *Nature*, London, 188(4746):200 202, Oct. 15, **1960.** fig., 12 refs., 2 eqs. **DWB**—Atmospheric densities derived from observations of the satellites Sputnik III and Discoverer VI are used to determine the exact form of the "wiggle" in the logarithmic density curve at altitudes 150–200 km. The form of the atmospheric density curve between 180 and 200 km indicates a temperature inversion in the F1-layer. It is not possible at present to decide whether solar ultraviolet radiation as well as He^+ line and solar X-ray radiation contribute to the heating at this height. There may also be contribution to the heating by corpuscular radiation. Similar "wiggles" may be expected in the E-layer and the F2-layer. *Subject Headings:* **1. Ionospheric densities 2. Upper air temperatures 3. Satellite observations.**—*R.B.* Ⓢ

12E–173 551.510.536:546.33

Rees, J. A. (*Dept. Math., Queen's Univ., Belfast, Ireland*), **Sodium vapour trails as a method of determining upper atmosphere temperatures and winds.** *International Space Science Symposium, Nice, Jan. 1960, Space Research: proceedings of the First Symposium.* Pub. **1960.** p. 207–214, 9 refs., eq. French and Russian summaries p. 207. **DWB** (523.1 161sp)—Trails of sodium vapour have been produced in the upper atmosphere between heights of 60 and 150 km by the ejection of sodium from rockets. The experiments were undertaken with the object of studying (a) the variation of temperature with height between these levels, and (b) the magnitude and direction of the prevalent winds. The temperature measurements are obtained by photographing the sodium trail through a Fabry-Perot interferometer and by measuring the widths of the sodium D line fringes produced. Information concerning upper atmosphere winds is obtained from a series of simultaneous photographs of the trail and star background taken from widely separated camera positions. Two methods of analyzing the wind data are described, a mechanical-optical method and an alternative computer method. *Subject Headings:* **1. Upper air temperature measurement techniques 2. Upper air wind measurement techniques 3. Sodium ejection.**—*Author's abstract.* Ⓢ

12E–174 551.510.53:551.507.362.1:551.507.362.2

†Science Communication, Inc., Wash., D. C., **Properties of the upper atmosphere: rocketsonde and satellite measurements of pressure, temperature, density, and composition through early 1960.** Contract Nonr 3071 (00) (Project ARIES), Report [Unnumbered], Aug. 1, **1960.** 3 p. of text. 13+4 p. of tables (fold.). Appendices B-C (8 p.) of bibliog. refs. with abstracts. **DWB** (M(051) 5416pr).—A compilation of reports, publications and direct communications of scientists who have made upper atmosphere structure measurements with sounding rockets and satellites. The charts presented refer to 30 to 300 km altitude range. The compilers have not "evaluated" data obtained. Over 90 per cent of the data available through the spring of 1960 are included in two tables. The first shows temperature, pressure and density data, the second presents composition measurements. Both tables are arranged by altitudes. *Subject Headings:* **1. Upper atmosphere structure 2. Rocket soundings 3. Satellite data.**—*E.K.* Ⓢ

12E–175 551.510.41:551.510.53

Townsend, John W., Jr. (*Goddard Space Flight Center, NASA, Wash., D. C.*), **Composition of the upper atmosphere.** *International Symposium on the Physics and Medicine of the Atmosphere and Space, San Antonio, Texas, Nov. 1958, Proceedings of the 2nd Symposium*, pub. N. Y., John Wiley, **1960.** p. 112–133. 6 figs., 2 tables, 37 refs., eq. **DLC, DWB** (M86:612 I612ph)—Deals almost exclusively with the composition of the upper atmosphere, that is, the air above balloon altitudes,

and particular emphasis is placed on the space from the beginning of the ionosphere to the maximu of the F2 region of the ionosphere (near 300 km). Direct measurements, made entirely throug the use of rockets and satellites are stressed. The composition of the troposphere, mesosphere, an the thermosphere are discussed separately. Not all the problems of the composition of the upp atmosphere have been solved by rockets. A number of critical measurements must still be unde taken. From the rocket and satellite density results it is apparent that there is a large increase i atmospheric temperature in the lower thermosphere beginning at about 120 km and ending at abou 180 km. From rocket scale height data it seems that the effect is far more pronounced over Fo Churchill, Canada, than over New Mexico. *Subject Headings:* **1. Upper atmosphere compositio 2. Upper air temperatures 3. Upper atmosphere densities.**—*E.Z.S.* Ⓢ

12E–176 551.510.535:551.524.7(548.1

†Venugopal, V. R. (*Kodaikanal Obs.*), **Temperature of the *F* region of the ionosphere ove Kodaikanal.** *Indian Journal of Meteorology and Geophysics*, New Delhi, 11(2):171–175, April **196** 2 figs., table, 20 refs., 3 eqs. **DWB, DLC**—Night temperature of the F region of the ionosphere ove Kodaikanal has been computed by the scale height method for the months of June and Decembe The temperature at a height of 300 km is found about 1200°K. It is also observed that winte temperatures are higher than summer temperatures. This summer to winter warming up may b due to the winds in the ionosphere. *Subject Headings:* **1. F region 2. Ionospheric temperatur computation 3. Kodaikanal, India.**—*Author's abstract.* Ⓢ

12E–177 551.510.535:536.5(548.1

Venugopal, V. R. (*Kodaikanal. Indian Journal of Meteorology and Geophysics*, New Delh 11(3):295–297, July **1960.** fig., table, 7 refs., 2 eqs. **DWB, DLC**—In this paper noon temperatu of the F2 region of the ionosphere over Kadaikanal has been computed by the scale height metho for the months of June and December of the years 1953 and 1954, the period of low sunspot activit of the present solar cycle. The mean temperature at a height of 400 km is found to be about 1500°K It is also observed that winter temperatures are higher than summer temperatures. This summe to winter warming up may be due to the winds in the ionosphere. *Subject Headings:* **1. F2 laye 2. Ionospheric temperatures 3. Kodaikanal, India.**—*Author's abstract.* Ⓢ

1961

12E–178 551.501.724:551.524.7:546.33(916.5

Blamont, J. E.; Donahue, T. M. and Lory, M. L., **Measurement of the temperature in the uppe atmosphere to 150 km in a rocket experiment.** *Physical Review Letters*, N. Y., 6(8):403–404, Apr 15, **1961.** table, 8 refs., 4 eqs. **DLC**—A brief record of the experiment carried out in the evenin twilight of March 2, 1960, at Hammaguir (near Colomb-Bechar), Algeria. Temperature measure ment between 100 and 150 km involved the observation of sunlight resonantly scattered from sodiu atoms in a cloud ejected from a Veronique rocket. The results of temperature measurement showe 215 ± 25°K at 100 km, and $616 \pm 150/115$°K at 150 km altitudes. *Subject Headings:* **1. Upper at mosphere temperatures 2. Rocket observation techniques 3. Sodium ejection 3. Hammaguir Algeria.**—*E.K.* Ⓢ

12E–179 551.524.7:551.594.5

Mathews, W. G. and Wallace L. (*both, Yerkes Obs., Univ. Chicago*), **Auroral temperature de termination from $A^3\Pi - X^2\Sigma$ bands of the N_2+ molecule.** *Journal of Atmospheric and Terrestria Physics*, London, 20(1):1–8, Feb. **1961.** 2 figs., table, 15 refs. **DLC**—A comparison of observe $N_2^+ A^2\pi \rightarrow X^2\Sigma$ (2,0) and (3,1) band profiles with calculated model intensity profiles at variou temperatures indicates that the auroral rotational temperature is 350 ± 75°K. This temperature i higher than the average of the determinations from the $N_2^+ B^2\Sigma \rightarrow X^2\Sigma$ bands but the difference i not sufficiently significant to affect the hypothesis that both band systems have a common excitatio mechanism. *Subject Heading:* **1. Auroral temperatures.**—*Authors' abstract.* Ⓢ

PART III. RECENT TRANSLATIONS AND ANALYTICS FROM SERIALS AND COLLECTED WORKS

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A. TRANSLATIONS

Akademiia Nauk SSSR, Bulletin [of the] Academy of Sciences, USSR, Geophysics Series, No. 5, May 1960 (issued Dec. 1960 by American Geophysics Union) (Transl. of original Russian in its **Izvestiia, Ser. Geofiz.**, No. 5, May 1960)

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Zubian, G. D., **On the inter-latitudinal exchange of warm and cold air masses in the stratosphere in winter,** p. 1–12 (Transl. of original Russian in *Meteorologiia i Gidrologiia*, Moscow, No. 1:3–12, 1959)

Pogosian, Kh.P.: **Stratospheric jet stream during the colder half of the year,** p. 13–22 (Transl. of original Russian in *Met. i Gid.*, No. 2:15–21, 1958)

No. 5, 1960

Mazin, I. P.: **On the icing of jet aircraft,** p. 1–9 (Transl. of original Russian in *Meteorologiia i Gidrologiia*, Moscow, No. 4:3–8, 1957)

Borisenkov, E. P.: **Diagnosis and prognosis of the position and intensity of jet streams,** p. 10–19 (Transl. of original Russian in *Met. i Gid.*, No. 8:21–27, 1957)

Shabelnikova, M. V.: **On the relationship between temperature gradients in the region of jet streams and the development of cyclones,** p. 20–26 (Transl. of original Russian in *Met. i Gid.*, No. 5:33–36, 1958)

Soviet Astronomy AJ, New York, Vol. 4, No. 4, Jan./Feb. 1961 (Transl. of original Russian of **Astronomicheskiĭ Zhurnal,** 37(4), July/Aug. 1960 [see below])

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Vorontsov-Vel'iaminov, B. A.: **Problema sravneniia razmerov galaktik,** [The comparison galaxy diameters], p. 778–780

Astrophysical Journal, Chicago, Vol. 133, No. 1, Jan. 1961

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Beiträge zur Geophysik, Leipzig, Vol. 69, No. 4, 1960

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Društvo Meteorologov Slovenije, Ljubljana, Meteorološki Zbornik, Vol. 2, 1959

Manohin, V.: **Vprašanje monsunov,** [Origin of monsoons], p. 1–10
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Geofisica Pura e Applicata, Vol. 45, Jan./April 1960

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Geografiska Annaler, Stockholm, Vol. 41, No. 2/3, 1959

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nternational Symposium on the Physics and Medicine of the Atmosphere and Space, Second, San Antonio, Texas, Nov. 10–12, 1958, Physics and Medicine of the Atmosphere and Space: Proceedings of the 2nd Symposium. Ed. by Otis O. Benson, Jr. and Hubertus Strughold. Arranged by Southwest Research Institute, San Antonio, Texas. New York, John Wiley, 1960.

Van Allen, James A.: **On the radiation hazards of space flight,** p. 1–13
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Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere an Space Research in Japan, Vol. 13, No. 4, 1959

Fukushima, Naoshi and Maeda, Rikio: **Three-dimensional consideration for current-syste of geomagnetic variations, Pt. 1, Current flow for polar elementary storm within a spheric conducting shell, Pt. 2,** p. 267–272
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Journal of Atmospheric and Terrestrial Physics, London, Vol. 20, No. 4, April 1961

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urnal of Glaciology, Cambridge, Vol. 3, No. 29, March 1961

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Journal of Meteorological Research, Tokyo, Vol. 12, No. 10, Oct. 1960

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Kakioka, Japan. Magnetic Observatory, Memoirs, Vol. 8, No. 1, March 1957

Endo, Hiroshi: **On the seasonal change of geomagnetic Sq. variation**, p. 1–11
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Kakioka, Japan. Magnetic Observatory: **Geomagnetic indices K and C for 1956 at Kakioka,** p. 65–67

Khar'kov. Universitet. Astronomicheskaia Observatoriia, Tsirkuliar, No. 20, 1959

Kuz'menko, K. N.; Pluzhnikov, V. Kh. and Petrenko, R. M.: **Fotograficheskie nabliudeniia komety Arenda-Rolana,** [Photographic observations of Arend-Roland Comet], p. 3
Kuz'menko, K. N. and Pluzhnikov, V.Kh.: **Opredelenie priamykh voskhozhdenii bol'shikh planet meridiannym krugom KHAO v 1958 godu,** [Determination of straight meridian passages of major planets at Kharkov Astronomical Observatory in 1958], p. 4
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Barabashov, N. P. and Garazha, V. I.: **O stroenii poverkhnostnykh sloev Luny i Marsa,** [Structure of the surface layers of the Moon and Mars], p. 5–18
Kuz'menko, K. N. and Pluzhnikov, V.Kh.: **Opredelenie priamykh voskhozhdenii bol'shikh planet meridiannym krugom KHAO v 1959 g,** [Determination of straight meridian passages of major planets at Kharkov Astronomical Observatory in 1959], p. 19–20
Kuz'menko, K. N. and Pluzhnikov, V.Kh.: **Opredelenie priamykh voskhozhdenii malykh planet meridiannym krugom KHAO v 1959 g,** [Determination of straight meridian passages of minor planets at Kharkov Astronomical Observatory in 1959], p. 20

No. 22, 1960

Samofalova, T. A. and Renskaia, K. V.: **Aktivnost' fotosfery i khromosfery Solntsa s 1 ianvaria po 31 dekabria 1957 g po nabliudeniiam Khar'kovskoĭ astronomicheskoĭ observatorii,** [Solar photospheric and chromospheric activity, Jan. 1–Dec. 31, 1957, according to observations at Kharkov Astronomical Observatory], p. 3–71
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Meteoritika, Moscow, No. 19, 1960

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Starik, I. E.; Sobotovich, E. V. and Lovtsius, G. P.: **Opredelenie soderzhaniia svintsa v zhele nykh meteoritakh,** [Determination of the lead content of iron meteorites], p. 100–102
Florenskiĭ, K. P.; Vronskiĭ, B. I.; Emel'ianov, Iu. M.; Zotkin, I. T. and Kirova, O. A.: **Pre varitel'nye rezul'taty rabot tungusskoĭ meteoritnoĭ ekspeditsii 1958 g.,** [Preliminar results of the work of the Tunguska meteorite expedition 1958], p. 103–134
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Meteorologiia i Gidrologiia, Moscow, No. 11, Nov. 1960

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Meteorologische Rundschau, Berlin, Vol. 13, No. 5, Sept./Oct. 1960

Flohn, H.: **Alfred Wegener (1.11.1880–Nov. 1930) zum Gedenken,** [In memory of Alfred Wegener (Nov. 1, 1880–Nov. 1930)], p. 129

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Faust, Heinrich and Attmannspacher, Walter: **Die allgemeine Zirkulation der aussertropischen Breiten bis 60 km Höhe auf der Basis der Nullschichtkonzeption,** [The general circulation in extratropical latitudes to a height of 60 km on the basis of the null layer concept], p. 6–10

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Monthly Weather Review, Wash., D. C., Vol. 89, No. 3, March 1961

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Moscow. Tsentral'nyĭ Institut Prognozov, Trudy, No. 92, 1960

Khrabrov, Iu. B.: **Formirovanie srednemesiachnoĭ temperatury vozdukha i ee predskazanie,** [Formation of mean monthly temperature and its forecasting], p. 3–12

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No. 98, 1960

Petunin, I. M.: **Daty osennego perekhoda temperatury vozdukha cherez 15° i prodolzhitel'nosti perioda osenneĭ vegetatsii ozimykh,** [Dates when the temperature crosses the 15-degree mark in the fall and length of the fall growing season of winter crops], p. 3–5

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Poland. Państwowy Instytut Hydrologiczno-Meteorologiczny, Wiadomości Służby Hydrologicznej i Meteorologicznej, Vol. 7, No. 4, 1960

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Polar Record, Cambridge, Vol. 9, No. 63, Sept. 1959

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International Council of Scientific Unions. Special Committee on Antarctic Research (SCAR): **S.C.A.R. Bulletin, No. 3, Sept. 1959,** p. 589–608

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Robin, G. de Q.: **Progress report on the Antarctic ice sheet,** p. 3–10

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Acta Geophysica Polonica, [Warsaw].
Acta Meteorologica Sinica, [Peking].
Akademiia Nauk SSSR, Izvestiia, Ser. Geogr. and **Ser. Geofiz.,** [Moscow].
American Geophysical Union, Transactions, [Washington].
American Meteorological Society, Bulletin, [Boston].
Angewandte Meteorologie, [Potsdam].
Annales de Géophysique, Centre National de la Recherche Scientifique, [Paris].
Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A and Ser. B, [Vienna].
Australian Journal of Physics, [Melbourne]
Beiträge zur Physik der Atmosphäre, [Frankfurt a. Main].
Ciel et Terre, Société Belge d'Astronomie, Météorologie et Physique du Globe, [Brussels].
Geofisica e Meteorologia, Società Italiana di Geofisica, [Genoa].
Geofisica Pura e Applicata, Istituto Geofisico Italiano, [Milan].
Geophysical Magazine, Japan Meteorological Agency, [Tokyo].
Hemel en Dampkring, [The Hague].
Időjárás, Magyar Meteorológiai Társaság and Országos Meteorológiai Intézet, [Budapest].
Indian Journal of Meteorology and Geophysics, [Delhi].
Journal de Mécanique et de Physique de l'Atmosphère, Société Météorologique de France.
Journal of Atmospheric and Terrestrial Physics, [London].
Journal of Geophysical Research, [Washington].
Journal of Meteorological Research, [Tokyo].
Journal of Meteorology, American Meteorological Society, [Boston].
The Marine Observer, Air Ministry, Meteorological Office, London.
The Meteorological Magazine, Air Ministry, Meteorological Office, London.
Meteorologické Zprávy [Prague].
Meteorological Society of Japan, Journal, [Tokyo].
La Météorologie, Société Météorologique de France, [Paris].
Meteorologiia i Gidrologiia, [Leningrad].
Meteorologische Rundschau, [Berlin].
Monthly Weather Review, U. S. Weather Bureau, Washington, D. C.
Polarforschung, Archiv für Polarforschung, [Kiel].
Przegląd Geofizyczny, [Warsaw].
Revista de Geofísica, Instituto Nacional de Geofisica, [Madrid].
Rivista di Meteorologia Aeronautica, Servizio Meteorologico, [Rome].
Royal Meteorological Society, Quarterly Journal, [London].
South Africa, Weather Bureau, Notos, [Pretoria].
Tellus, Svenska Geofysiska Föreningen, Stockholm.
Vsesoiuznoe Geograficheskoe Obshchestvo, SSSR, Izvestiia, [Leningrad].
Weather, Royal Meteorological Society, [London].
Weatherwise, American Meteorological Society, [Boston].
Wetter und Leben, Österreichische Gesellschaft für Meteorologie, [Vienna].
WMO Bulletin, World Meteorological Organization, [Geneva].
Zeitschrift für Meteorologie, Meteorologisches Observatorium, Potsdam.

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